NetworkWorld

April 20, 1998 Volume 15, Number 16

Ranking the Industry's Biggest and Baddest Competitors

Taking stock of perennial powerhouses

The merger and acquisition frenzy

The story behind the corporate name game

Four CEOs who make a difference

NEWSPAPER $5.00

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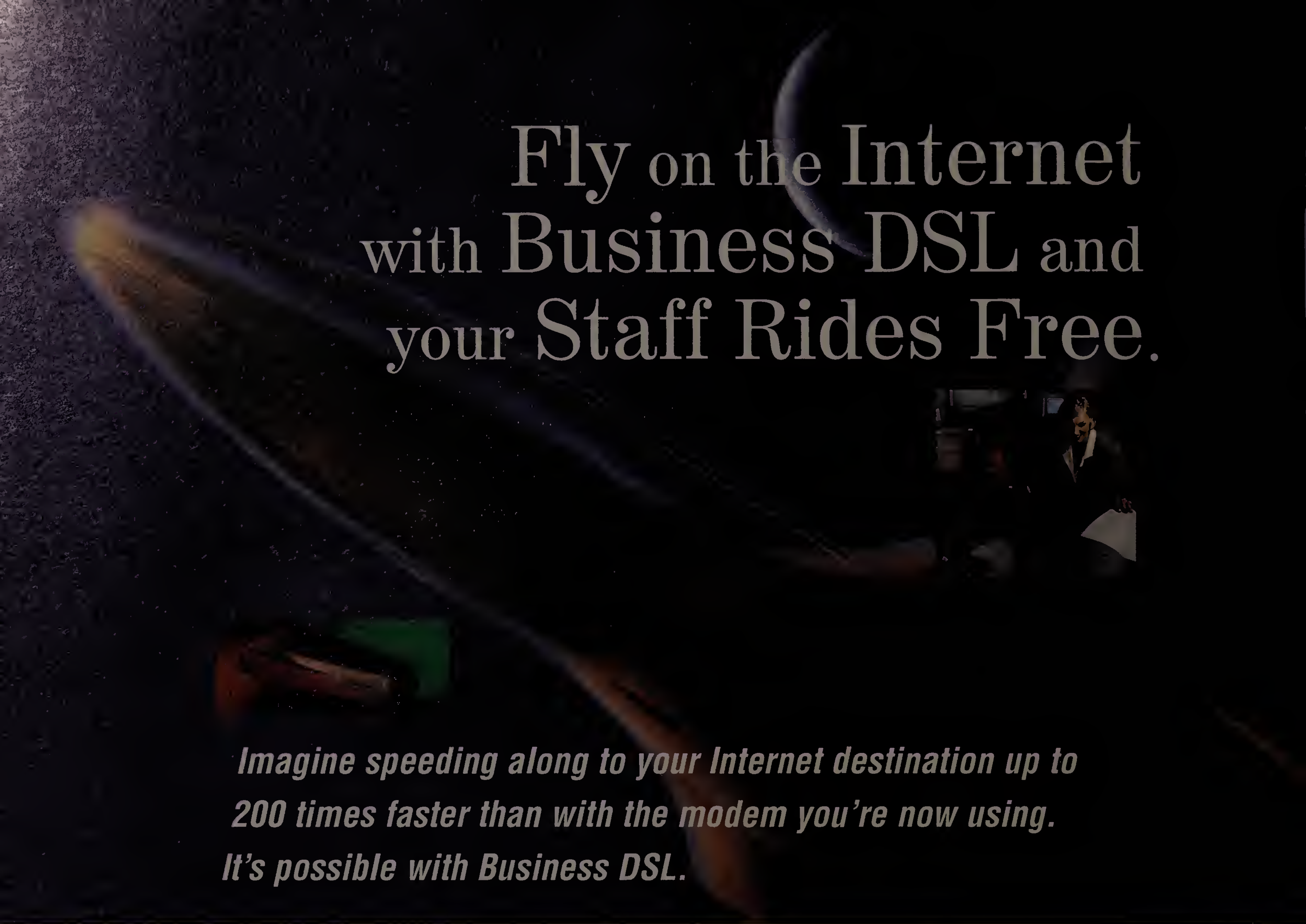
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JOHN GALLOWAY

PSYCHED ABOUT IPSEC

Chrysler's Fred Hakim is encouraged by interoperability among IPSec-based firewalls. Page 8.

POWER PACKED

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Cabletron boss explains the new game plan. Page 10.

SHAWN HENRY

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The Network World 200

Big and Bigger

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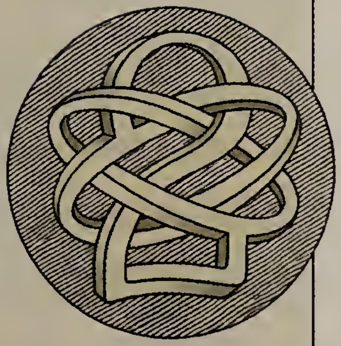

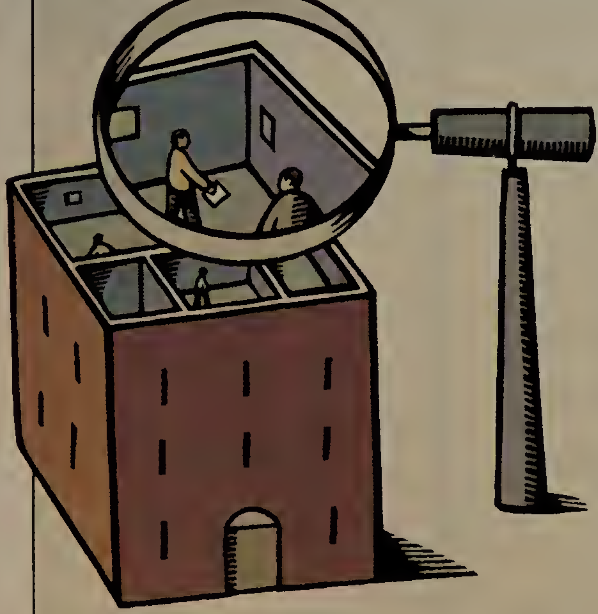

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The Stalwarts. Cabletron, 3Com, AT&T, Netscape, Cisco. All established players, but competition is making things tough on everyone. The challenges ahead. **Page 63.**

The Name Game. The interesting and often funny stories behind those shiny corporate monikers. **Page 77.**

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This Week

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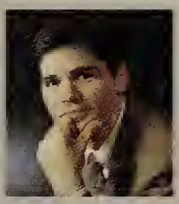
Workflow. You don't hear that much about workflow anymore. The World Wide Web, however, is going to change that. Find out why. **DocFinder: 6728**



Keeping Current. Everybody keeps talking about the wireless revolution. Fred McClimans says hold the revolution without him – first he wants to see a cellular company figure out how to bill customers properly. **DocFinder: 6729**

Frame relay. Did you get hit by the AT&T frame relay outage last week? If so, what would you have done differently – and are you making new backup plans? Talk about it in our outage forum. **DocFinder: 6730**

Token ring. Is this a technology with a future, or should its backers get a life? Read what others have said, and add your comments. **DocFinder: 6732**

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Volume I, Issue 4

IBM

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AT&T frame relay service goes down for the count

T-1 shortage hinders backup moves; frame relay SLAs suffer new setback.

By David Rohde and Sandra Gittlen
Basking Ridge, N.J.

When it was all over, everyone agreed: Even a major fiber cable cut would have been better than this.

AT&T last week suffered the catastrophic failure of its frame relay network. All of the company's 145 switches were brought down, leaving thousands of frame relay customers offline for more than 24 hours. The event laid bare numerous weaknesses in the carrier's network infrastructure and product management.

The network failed at about 3 p.m. Monday and did not completely recover until Tuesday evening. Although AT&T on Friday was still uncertain about what caused the collapse of its network, the carrier did say the failure stemmed from a problem between two Cisco Systems, Inc. StrataCom frame relay switches; one in Albany, N.Y., and the other in Cambridge, Mass. From there, the problem propagated across the network, according to AT&T.

"We know we offer the best data network in the world. To underscore our own confidence, we decided to create a comprehensive program of rigorous SLAs that covers all aspects of frame relay service."

Steve Hindman, AT&T data services vice president, Jan. 27, on announcing 99.99% network availability and four-hour PVC restoral guarantees.

With AT&T saying so little, observers were left speculating about the root cause of the crash. Analysts suggested the cause to be either a traffic overload that flooded the network with reroute messages or a failure in the forwarding tables that left switches without instructions where to send traffic.

But the frame relay failure was just the start of the problem for the company, which relies on frame relay for $1 billion in revenue each year.

High-volume users frantically seeking backup protection reported that AT&T's shortage of T-1 access capacity forced the company to seek other carriers' facilities to terminate remote dial-up sessions.

AT&T's T-1 shortage first came to a head this past winter (*NW,* Feb. 16, page 1). The shortage became a major headache last week when AT&T's standard frame relay backup options were rendered useless by the fact that the switches, rather than the physical routes, got knocked out.

At press time, AT&T officials said they had still not discovered the root cause of the failure. AT&T Chairman and CEO C. Michael Armstrong said in a briefing with reporters that the company would not charge customers for frame relay service until the network was restored and the root cause was identified and fixed.

But some users thought AT&T had an obligation to go even further. In January, AT&T announced service-level agreements (SLA) that included 99.99% availability of the frame relay network. At the time, AT&T Data Services Vice President Steve Hindman promised a four-hour mean-time-to-repair guarantee, or customers would receive free ports and permanent virtual circuits (PVC) for a month.

An AT&T spokesman last week said the SLAs had slipped past the scheduled March general availability date. But he confirmed some larger customers had been given the guarantees anyway.

Six jets and 9.6K modems

Thrown back on their heels, nearly every user contacted by *Network World* reported that they did not have enough backup lines to keep their networks running. Many resorted to unusual measures. One giant pharmaceutical company had to call in a fleet of six jets.

Some of the pharmaceutical company's 80 sites had ISDN backup, but others had mere 9.6K modems, said a network manager at the company, who requested anonymity. Only half of the company's orders were able to get through via dial-up, so the company brought in the planes to fly paper orders to distribution centers. The company did not get its frame relay fully restored until mid-morning Wednesday.

One of AT&T's largest frame relay networks, the 7,000-node WorldSpan network connecting airlines to travel agencies, was crippled for 24 hours, according to a WorldSpan spokeswoman. Some travel agencies were able to dial up WorldSpan's Atlanta data center, but most could not.

In fact, retailers, distributors and companies connected to outside agencies in businesses such as travel or insurance seemed to have had a particularly hard time. Loren Wilkinson of Egghead.com reported that the online computer retailer lost communications between its headquarters in Spokane, Wash., and its distribution center in Sacramento, Calif., for 36 hours.

"During that period of time we were unable to pass orders to ship to customers. Thanks, AT&T!" Wilkinson wrote in a posting on Network World Fusion.

Pier 1 Imports, Inc., in Fort Worth, Texas, lost communication among its regional offices, zone offices and the home office for more than 24 hours. The company was getting ready to put out a bid on adding 700 stores across the country to an existing frame relay network, said Brad Williams, the company's senior telecommunications analyst.

MORE ONLINE
A forum to discuss the outage and its implications.
www.nwfusion.com 6727

"From now on, we're going to query vendors about their backup contingency plans in a similar scenario," Williams said.

One big bank did not wait to seek out other carriers. San Francisco-based Wells Fargo Bank saw more than 1,000 automated teller machines in California go down Monday afternoon because they could not connect over AT&T's frame relay network to the bank's data center.

Not all the ATMs could be accommodated on ISDN dial backup because Wells Fargo did not have enough ISDN Primary Rate Interface lines into its Roseville, Calif., data center. And Roseville Telephone Co., the local exchange carrier, could not get any spare T-1 capacity from AT&T to concentrate dial-in access from points outside the local calling area.

At that point, MCI Communications Corp. stepped in. "We tested and turned up 12 T-1s of capacity in seven hours," said Jeff Jordeson, an MCI senior technical services manager in Sacramento. Overnight, MCI and Wells Fargo converted the remaining sites that were on the frame relay network to MCI dial-up. Sherry Nash, Wells Fargo senior vice president for data networking, said she was so delighted with the arrangement that she kept the dial-up lines open until Wednesday night, 24 hours after the outage had ended.

Some AT&T customers do have financial protection beyond the credits promised by Armstrong. For example, drugstore retailer Walgreens Co., in Deerfield, Ill., was one of the lucky ones assigned an SLA after AT&T's January announcement.

Ray Sheedy, Walgreens' director of corporate telecommunications, said 278 of the company's stores connected via AT&T were down for 24 hours. Walgreens'

See AT&T, *page 16*

DAMAGE CONTROL

How to limit your vulnerability when carrier data networks fail:

1. Consider an ATM service for data center sites.
2. Don't rely on dual PVCs, installed for different applications, as a backup option. Concentrate backup options around diverse local loops, services and carriers.
3. Shorten network service contract terms and sync your voice and data network contracts. More robust SLAs generally require a new contract. Falling telephony rates also minimize the need for longer contracts.
4. Make sure you have ISDN PRI circuits installed or available anywhere your traffic requirements equal or exceed the capacity of a T-1 line.
5. Don't duplicate your entire frame relay network. It's a budget-buster and a management nightmare. But consider regional clouds with two or more carriers to prevent your entire network from failing.
6. Approach competitive local exchange carriers (CLEC) about national network needs. Some CLECs are turning into long-distance carriers with an end-to-end focus.

News briefs, April 20, 1998

Microsoft partners woo legacy mail users

■ Microsoft Corp. last week announced that a slew of its partners have launched initiatives to convince users of legacy mail systems, such as cc:Mail and Microsoft Mail, to migrate to Microsoft's Exchange Server. Among the Microsoft partners offering incentives, such as free consulting and discounts, are Digital Equipment Corp.. Data General Corp., Software Spectrum, Inc., Compaq Computer Corp. and Dell Computer Corp. Details of the migration programs can be found at a new Web site, www.microsoft.com/exchange/migrate.

Teledesic royalty

■ Teledesic LLC is now $200 million richer thanks to an investment from His Royal Highness Prince Alwaleed Bin Talal Bin AbdulAziz Alsaud, of Saudi Arabia. The prince last week made the investment in Craig McCaw and Bill Gates' "Internet-in-the-Sky" satellite Internet services company. Alwaleed, a savvy entrepreneur, has made investments in other high-tech companies, including Apple Computer, Inc., Motorola, Inc. and Netscape Communications Corp. Teledesic's satellite-based Internet access services are expected to be available in 2002. The network will be based on a constellation of low-earth orbit satellites.

His Royal Highness Prince Alwaleed *(center left) of Saudi Arabia invested $200 million in Teledesic, while Teledesic co-CEO Craig McCaw (center right) watched.*

Inktomi inks net caching software deals

■ Start-up Inktomi Corp. last week announced plans to license its Traffic Server network caching software to Digital Equipment Corp. and AOL Interactive Services, a division of America Online, Inc. AOL will use Traffic Server to improve Web service performance for more than 13 million online members. Digital will port Traffic Server to Digital Unix for the Alpha platform. Digital expects the software to improve server-to-server communication performance.

Offering first-class IP connections

■ Scientists from two U.S. Department of Energy laboratories last week successfully demonstrated class-based queuing (CBQ) technology, which prioritizes data transmissions over IP-based networks.

The technology could be ready for commercial implementation as soon as year-end and would let Internet service providers offer faster, more reliable IP connections. CBQ is backed by the likes of Cisco Systems, Inc. and Sprint Corp. Scientists at Lawrence Berkeley and the Argonne National Laboratories, which developed the technology, use CBQ to share massive data files with each other and with the other 28 national laboratories around the country.

Thin-client vendors ready to rumble in Vegas

■ Executives from IBM, Sun Microsystems, Inc., Microsoft Corp. and other thin-client product vendors will face off in a presidential-style debate at next month's NetWorld+Interop 98 show in Las Vegas. The idea behind *Network World's* "Thin-Client Face-off" is to get thin-client movers and shakers to outline their strategies and address important issues such as management and implementation — without the usual marketing shinola. The event will be held from 10:30 a.m. to noon, Tuesday, May 5, in the Las Vegas Convention Center, Rooms 219 and 220.

Auto industry drives firewall testing

By Ellen Messmer

Detroit

The automotive industry next week plans to announce results of the first interoperability tests on firewall and encryption gateways that support the IP Security (IPSec) protocol for secure electronic commerce.

Eight vendors are expected to make the grade for IPSec interoperability, but network managers at the Big Three car makers cautioned that there's no reason to pop the champagne yet. While encryption works fine between different vendors' IPSec equipment, there are unsolved interoperability problems related to sharing X.509 public-key digital certificates.

By swapping digital certificates, IPSec equipment should be able to authenticate the identities of the sender and receiver before opening an encrypted session.

But certificate vendors, such as Entrust Technologies, Inc. and VeriSign, Inc., use proprietary methods of validating their certificates against certificate revocation lists.

Fixing that problem could prove difficult. It turns out that some of the technology for the IETF's proposed Public-Key Infrastructure Exchange (PKIX) standard is held under patent by Nortel, which spun off Entrust about a year ago. For more than a year, Entrust has been pushing PKIX at the IETF, but Nortel secretly applied for a patent for some of the PKIX technology without telling the standards group.

"In the standards community, we call it a torpedo patent," said Robert Moskowitz, senior technical director at the International Computer Security Association (ICSA), which has been testing IPSec equipment on behalf of the Automotive Industry Action Group.

Because the IETF is loath to approve patented technology as a standard, PKIX is now being revised. This could mean delays for the IPSec enthusiasts in the auto industry, though an Entrust engineer said people shouldn't overreact.

"It's part of a misunderstanding," said Brian O'Higgins, Entrust's chief technical engineer.

"We file for 20 or 30 patents a year. We don't talk about them until they are granted. The instant the patent was granted, we informed the IETF," O'Higgins said.

Now for the good news

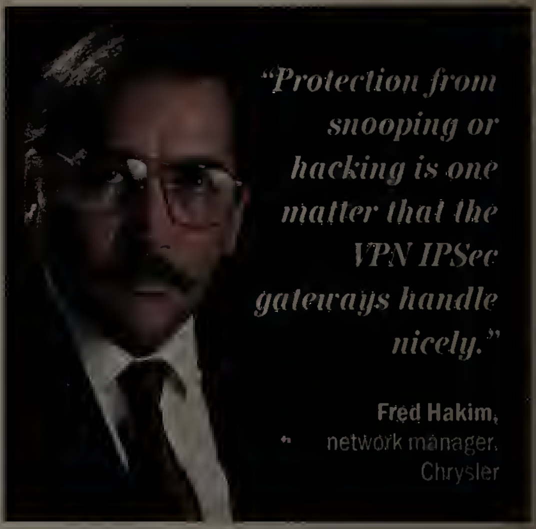
The good news is there is interoperability between IPSec products — except among different vendors' public-key certificates.

The ICSA tested firewalls to see if the IPSec equipment could set up encrypted sessions with each other using the Internet Key Enchange (IKE) with "pre-shared" keys. CheckPoint Software Technologies, Ltd., Time-Step Corp. and six other vendors will have the work they put in on this limited use of IPSec rewarded by the Automotive Engineering Task Group, through official recognition next week.

IKE is the new name for the automated key-management protocol formerly called ISKAMP/Oakley 8.

Using IPSec equipment with pre-shared keys, the auto industry already shares secure e-mail, electronic data interchange and files, said John Bremenkamp, telecommunications specialist at Caterpillar, Inc.

Eventually, IPSec will be used to secure traffic across the Internet, too, said Fred Hakim, a network manager at Chrysler. "Protection from snooping or hacking is one matter the [virtual private network] IPSec gateways handle very well," he said. ■



"Protection from snooping or hacking is one matter that the VPN IPSec gateways handle nicely."

Fred Hakim,
network manager,
Chrysler

Making the grade

The ICSA is certifying the following vendors' IPSec-compliant firewalls and encryption devices for limited interoperability:

- ☑ Check Point
- ☑ Cisco
- ☑ Information Resource Engineering
- ☑ Radguard
- ☑ Raptor
- ☑ TimeStep
- ☑ Trusted Information Systems
- ☑ VPNet Technologies

Cisco to license IP address mgmt. software

By Tim Greene

San Jose, Calif.

Cisco Systems, Inc. this week will announce an agreement with American Internet Corp. (AIC) to license IP address management software needed to support Cisco's policy-driven network administration effort.

AIC will license Network Registrar software to Cisco, which will include the software in its CiscoAssure Policy Networking package. This package is designed for administering and enforcing net access and quality-of-service policies across Cisco switch and router networks.

Cisco announced last month that CiscoAssure would include an enhanced version of Cisco's DNS/DHCP Manager server, software that binds network names and addresses to specific policies. Instead, Cisco has decided to replace that software with Network Registrar.

"American Internet's product is already well-oriented toward doing policy-centric assignments, and it also is scalable — more so than [Cisco's DNS/DHCP Manager]. For one thing, [Network Registrar] can be used by more than one administrator at the same time," said Bruce Roberson, an analyst with META Group, Inc., a consulting firm in Stamford, Conn. ■

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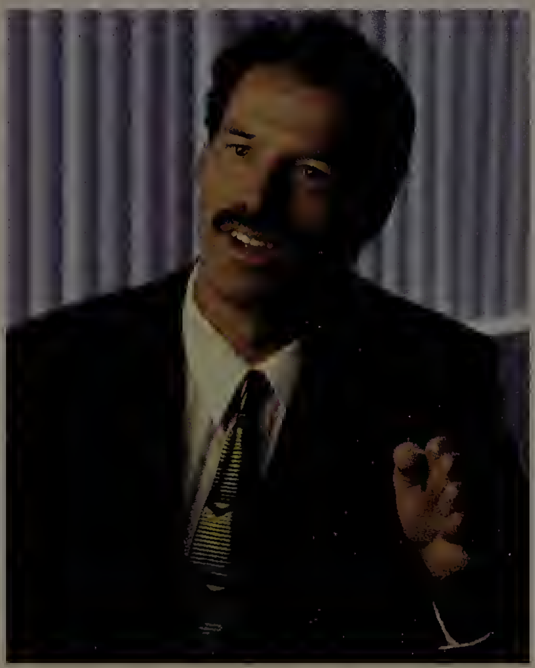
Cabletron boss tackles tough questions

Craig Benson has had a heckuva busy month. First he gained day-to-day control of Cabletron Systems, Inc. by taking the CEO title from Don Reed. Then he immediately went to work enhancing the plans Reed put in place over the past eight months (see story, below). Then he added a few plans of his own.

Network World editors last week trekked up to the company's Rochester, N.H., headquarters and grilled Benson about where Cabletron has been and where it's going.

Let's talk first about the transition. It seemed to be very sudden. What was behind that?

This is a pretty sudden industry. So to ask why things move fast — it is the culture of the industry, whether you like it or not. And the reason that the transition happened so quickly is because both Don and I agreed that if you're going to be in charge, you're in charge. So with us it's clear who is doing things.



And I'll give you the counter to that. Prior to my coming back, I gave up my office here for the exact same reason, so that we could clearly remove me from the equation. Now I was still here every day bouncing around, but nobody could find me and no one knew where to nail me down. And that was sort of a sign to everybody that you're not to ask me about X, Y and Z.

But it seemed to the outside that it was very sudden, as though the plan Reed had instituted was not working, and you were taking control again.

Don and I have been talking about this for three months. And so to the outside it was sudden. But to Don and myself, who were the only two who were party to the conversation, this had been going on for awhile.

There's some sense that you are coming in to more actively execute Reed's strategy. But then there's also a sense that you are infusing a new strategy. What's the balance?

The strategy that Don put together was very comprehensive. I wholeheartedly signed up for it but for one difference. The acquisition strategy, the relationships with channel, the ability to bring a solution to our customer, I'm 100% behind them. Don [also] wanted to have business units associated with Digital [Equipment Corp.] and Cabletron and Spectrum.

The Digital and Cabletron split did not and does not make sense to me. I think our customers benefit from having a combined product set that shares all the features and benefits across the board. And I think it was too narrowly focused before. So really what I want to make sure we do is take all our resources and put them toward broadening the product line, making the product line from top to bottom play together.

Is it true that Cabletron is going to give up the idea of end-to-end and focus just on Spectrum and switching?

Yes, but we'll be in other markets as well. We're going to focus on our core strengths. Switching and management are two of them. We're already in other markets. We have the routing product we just got from YAGO [Systems, Inc.]. We expect that to do very well for us. We also acquired, with Digital, software-based router technology as well as remote access routing. So we're going to focus on core strengths, but we have other products that really leverage a much broader product solution for customers.

But you are not going to try to be what 3Com [Corp.] is attempting to be and offer every single piece of the network?

I have a philosophical difference with all these guys. Nobody is end-to-end. Let's get real. I personally don't believe these guys who say they're end-to-end are end-to-end.

How is Cabletron going to eliminate products?

We're not going to make them available in catalogs anymore. But if customers want things, we have manufacturing sources available.

But what products are you going to eliminate?

The things we're going to knock off are the things we haven't sold in two years. FDDI adapter cards that we don't sell anymore, crazy things that are still on the price list.

The bigger question is, as you focus on these core strengths, are there whole product areas you intend to get out of?

No. No.

What kind of culture are you going to try and create, and what kind of personality do you want Cabletron to have?

I can try to summarize it in one word — that's limit the bureaucracy, maximize the opportunity to work with customers and make decisions. Efficiency, I would say, is the brand that I would propose to put on the organization.

Are there other values? There was some talk about trying to become No. 1 in employee satisfaction.

It's a three-legged stool. Most people concentrate on the compensation and benefits portion of it. And that's one of the legs. [Another] leg is to feel empowered at your work so you go home every day feeling like, wow, I really made a difference. And the third one is to work for a company where you feel like you're a winner. ■

Cabletron forges ahead

Last week, Cabletron CEO and co-founder Craig Benson has released a plan to convince customers, employees and investors that the company has what it takes to not just survive, but to thrive.

In his short time at the helm, Benson has:

- Reshaped the management team.
- Decided to fold the Digital Network business fully into Cabletron.
- Created a customer advisory council and assigned executives to handle key accounts.
- Committed to acquiring or building lower priced products.
- Decided to eliminate some older products.

While Benson said he will still implement former CEO Don Reed's strategic vision for the company, Benson has already discarded Reed's organizational chart. Under Reed, Cabletron had three separate operating divisions — an enterprise business unit, a Digital Network Product Group (DNPG) unit, and a Spectrum group. Benson has reorganized the company based on services, rather than products.

Toward that end, Benson has combined five disparate marketing groups into one unit reporting to Allen Finch, who was recently promoted to senior vice president for marketing and corporate strategy.

And despite folding the Digital unit into Cabletron, Benson also told *Network World* that all Digital products will remain branded under the Digital name. That doesn't mean, however, that Cabletron and Digital products won't share technologies.

"What our customers want is migration for the products they've already bought . . . common features, common benefits, common ability to troubleshoot with less training, but available in a number of form factors so that they can feel comfortable moving with technology," Benson explained.

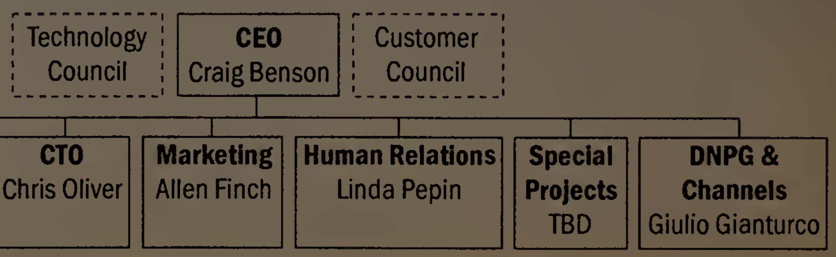
While Benson confirmed that Cabletron will focus on switching and management services, he said he had no immediate plans to downsize the company or to stop making products for existing customers. He did say, however, that a number of products that haven't sold in the past two years will quietly disappear from Cabletron's catalog.

In another broad move, Cabletron will revise its pricing structure, something for which the company has long been criticized. Like many network companies, Cabletron releases a product with a list price that almost no one pays. Benson and other executives refused to release further details, saying only that the new strategy will be released at the beginning of May at NetWorld+Interop 98 in Las Vegas.

—Robin Schreier Hohman

THE CABLETRON FAMILY TREE

Cabletron's new organization: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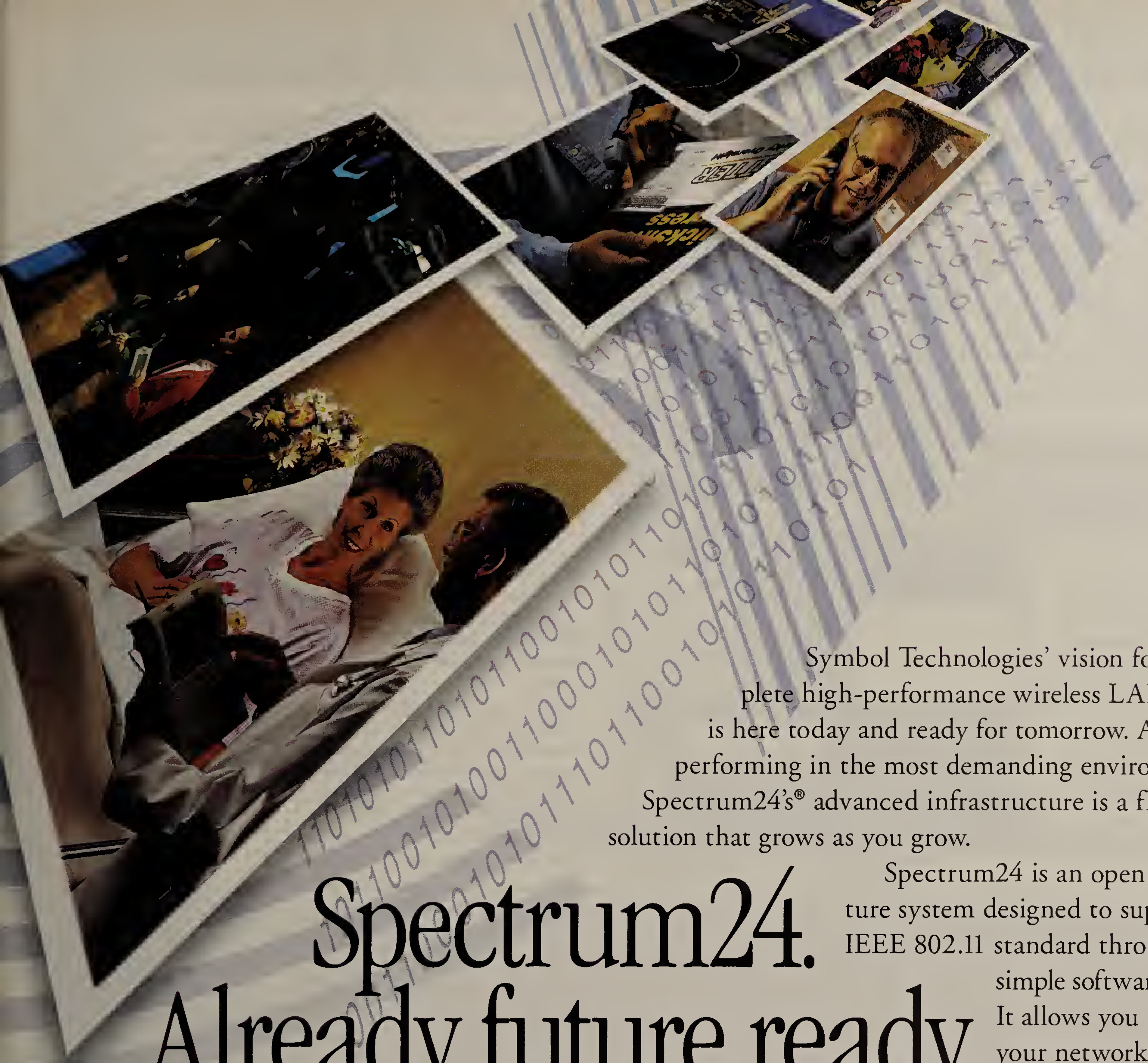

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>
> –Andrew Seybold,
> editor in chief,
> *The Outlook*

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Oracle pledges to support Java 300%

Software maker releases JDeveloper Suite and AppBuilder for Java.

By Andy Eddy
Redwood Shores, Calif.

If there's any question about Oracle Corp.'s dedication to Java, last week's frequent proclamations of "300% Java" at a press gathering to announce the company's new product launches can be taken as an answer.

Though the math isn't 100% correct, last week's release of JDeveloper Suite 1.0 and AppBuilder for Java 1.0 sounds Oracle's initiative loud and clear. The company's support for Java throughout three tiers of the network infrastructure — client, application server and database server — enables users to access data regardless of platform, supports the concept of network computers and stands to improve overall performance by sharing the workload among components.

Oracle also announced that it plans to issue a Java-enabled version of its Oracle8 database server, Release 8.1, by year-end. The package will include its own Java Virtual Machine and support for Enterprise JavaBeans (EJB).

Oracle Chairman and CEO Larry Ellison expressed his views on the difference between Microsoft Corp.'s model and a Java model, saying that Microsoft's strategy of putting servers everywhere is "unmanageable" from a maintenance standpoint.

Ellison also claimed the Java support in these latest products would reduce the cost to that of an enterprise, thanks to the lowered equipment needs. Also, the Java support would provide for low- or no-administration thin clients acting as terminals, he said.

AppBuilder for Java 1.0 delivers support for JavaBeans and EJB, which enables the development of applications by combining prebuilt components, an easy task even for nonprogrammers. Also, developers looking to reduce the quantity of programming can use structured query language for Java, which requires fewer lines of code compared with writing directly in Java.

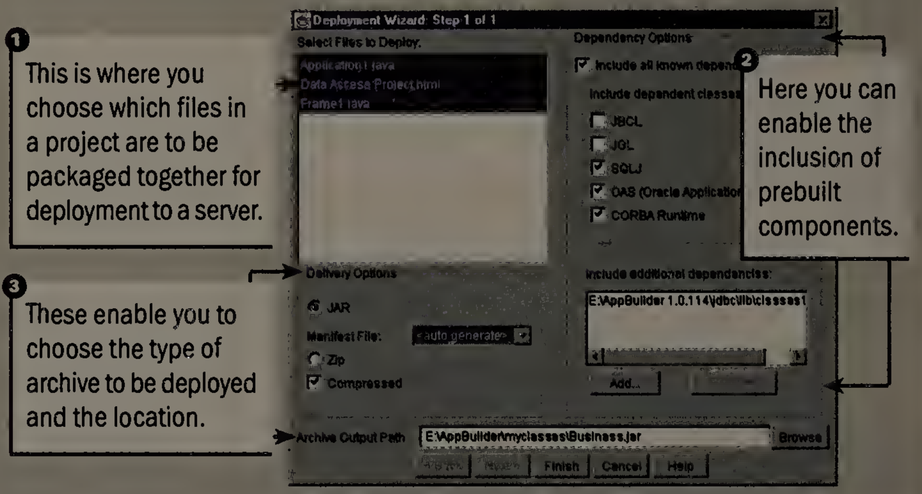
In an effort to reduce the workload even more, built-in wizards can run the developer through various layout options over a series of screens, generating the final code dynamically from those selections. The wizards also enable the simple deployment of the resulting applications across the network.

The JDeveloper Suite 1.0, priced at $2,995, comes with AppBuilder for Java, Oracle Application Server 4.0, Oracle8 and Symantec Corp.'s Visual Page HTML editor.

© Oracle: (650) 506-7000

APPBUILDING THE JAVA WAY

Deploying Java applications to a server is easy with the Deployment Wizard provided in Oracle's AppBuilder for Java.



① This is where you choose which files in a project are to be packaged together for deployment to a server.

② Here you can enable the inclusion of prebuilt components.

③ These enable you to choose the type of archive to be deployed and the location.

Cisco grabs IP voice partner

By Tim Greene
San Jose, Calif.

Cisco Systems, Inc. this week will announce plans to team with start-up NBX Corp. to eliminate the need for separate phone and data networks in corporate branch offices.

The partnership entails integrating NBX's Ethernet phone gear with Cisco's IP voice-enabled branch office routers. The agreement is in keeping with the broad initiative Cisco announced earlier this year to help customers meld voice, data and video traffic on their enterprise networks (*NW*, Jan. 19, page 55).

Cisco and NBX will provide technology for making IP voice calls across frame relay and other corporate data networks or over the public dial-up phone network. The twist is that companies won't need to use small-office phone switches, which are known as key systems.

Instead, a LAN-to-telephone network gateway, called the NBX 100, will connect LAN-based NBX Ethernet telephones to the public telephone network over as many as five analog phone lines.

"This is a competitor to a key system in a branch office," said Dan Taylor, an analyst with Aberdeen Group, Inc., in Boston.

Cisco and NBX will integrate NBX 100s with Cisco 2600 and 3600 routers so local Ethernet phone calls can be routed across a corporate wide-area data network as well.

When an end user dials a phone number, an NBX 100 will call out to the public network or divert the call to a local router. If the call is routed across the corporate WAN, a router and NBX 100 at the other end of the line will complete the call. This eliminates the need to use the public dial-up network and can avoid the use of dedicated phone trunks between corporate sites.

The Cisco-NBX system can even make for less expensive long-distance communications when the calling destination is not on the corporate network. For example, an employee in New York could call an off-net site in Los Angeles by going through the corporate network and having the call transferred to the off-net destination via an NBX 100 in Los Angeles.

The NBX device also completes calls within the same office and provides traditional key system features such as voice mail, call-detail recording, paging and music on hold. In addition, the NBX 100 supports computer-telephony integration.

Cisco picks up the phone

The integration of NBX's Ethernet phone gear with Cisco's branch office routers will:

- Enable voice over IP networks.
- Integrate IP voice with the public phone network.
- Eliminate the need for dedicated voice trunks.
- Save on long-distance phone bills.

Taylor said the Cisco-NBX alliance goes hand in hand with Cisco's introduction earlier this year of voice/fax cards for its 2600 and 3600 routers. The routers guarantee voice quality through traffic prioritization features in Cisco's Internetwork Operating System software.

The Cisco-NBX system will be demonstrated next month at NetWorld+Interop 98 in Las Vegas.

© Cisco: (408) 526-4000; NBX: (978) 749-0000

For the answer to this week's question and more net trivia, **visit Network World Fusion** and enter **2349** in the DocFinder box.

This week's question:

What was William Kennard's job before he was named Federal Communications Commission chairman?

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Senior Editor: *Peggy Watt, Phone: (650) 903-9519, Fax: (650) 968-3459*
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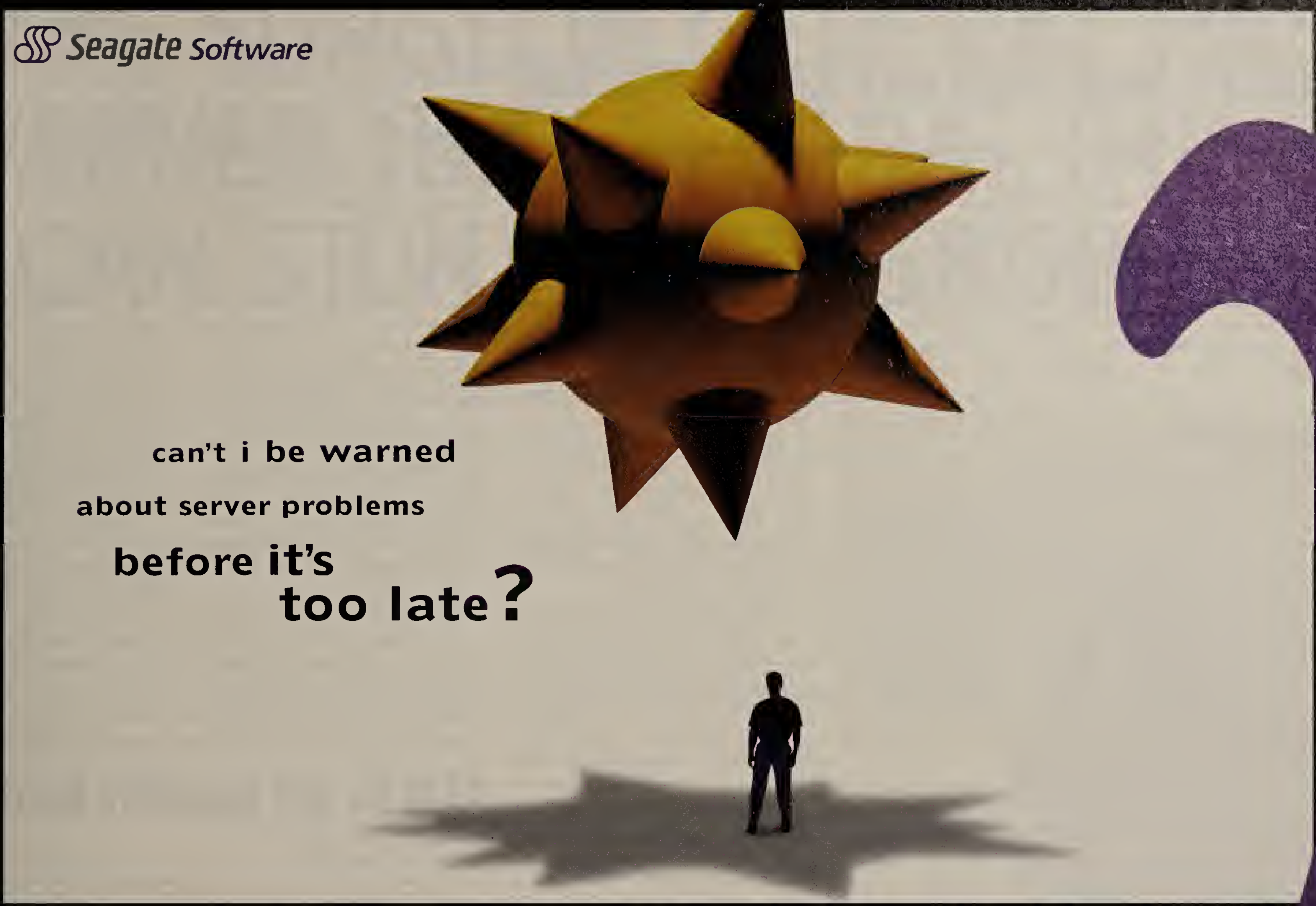

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DSL users face unpredictable pricing

Still, prices are proving to be lower than those for competing network services.

By Tim Greene

In one sense, the promise of low-cost WAN access links has been fulfilled by early digital subscriber line (DSL) service rollouts: DSL is cheaper than traditional dedicated links with similar bandwidth.

DSL PRICES ALL OVER THE MAP

A sampling of the widely varying prices for DSL services:

Company	Speed	Price per month
CADVision	2M bit/sec	$50*
Covad	1.1M bit/sec	$195
NorthPoint	1.04M bit/sec	$199
PacBell	1.5M bit/sec	$250
US WEST	1M bit/sec	$120*
Vitts	7M bit/sec	$99*

* Includes Internet access fee

But the price for DSL services varies widely, depending on whom the carrier's customer is, the current cost of DSL alternatives and what kind of traffic will be run over the link.

Some carriers charge two or three times what others charge for the same DSL bandwidth. Yet all carriers use the same basic technology to carry broadband data over common phone wires.

For example, Vitts Networks, Inc., a competitive local exchange carrier (CLEC) in Manchester, N.H., charges $70 per month for a 128K bit/sec dedicated DSL link to the Internet. Meanwhile, US WEST, Inc.'s unregulated !nterprise business offers DSL Internet access to business and residential customers in 40 cities at twice that bandwidth for a mere $40 per month.

Why does !nterprise charge so much less? Basically, because !nterprise has geared the service toward residential customers and needs to make the price comparable to that of competing residential cable modem services, according to Greg Gumm, DSL product manager for !nterprise.

Vitts, on the other hand, has priced its offering for business customers and serious Web surfers. And Vitts has only limited competition in its territory, to boot.

Over time, low prices for residential DSL services are expected to put pressure on DSL prices for businesses, according to Beth Gage, a broadband analyst for TeleChoice, Inc., a consultancy in Verona, N.J. But in the short run, DSL prices for businesses will be based on what users are already accustomed to paying for bandwidth.

The DSL providers figure a corporate customer paying $500 to $1,000 per month for a T-1 access line would welcome similar bandwidth for $250 per month, regardless of whether the carrier could afford to offer DSL service for even less. For example, Covad Communications Co., a competitive local exchange carrier in San Francisco, charges a flat $90 per month for a 144K bit/sec DSL access line. The $90 DSL line doesn't actually connect to anything except the Covad network, so the customer also has to buy a dedicated link from Covad's network to the corporate central site for a minimum of $975 per month.

Even so, the monthly overall bill can be smaller than that for direct-dial ISDN lines, which offer roughly the same bandwidth but are billed according to usage, said Robert Guttierrez, network engineer for Microsoft Corp.'s webtv business, a Covad customer.

Some carriers are pricing DSL services in such a way that DSL won't eat too much into revenue generated by existing services. Vitts sells traditional 1.5M bit/sec T-1s for $999 per month, and asymmetric DSL (ADSL) for $99 per month. ADSL service bandwidth varies depending on the quality and length of each customer line, but the bandwidth can range up to 7M bit/sec for downloads and 1M bit/sec for uploads.

The ADSL offering may seem to be a bargain compared with T-1 service, but there is a catch: Vitts restricts how customers use ADSL lines. Customers get only one IP address and are prohibited from using ADSL lines for Web hosting. If customers want unrestricted use, they have to pay an extra $500 per month.

"Otherwise [ADSL] would cannibalize the T-I service for a fraction of the price," said Mark Samber, a Vitts spokesman.

Carriers unconcerned about such cannibalization tend to charge less for DSL. For example, Canadian Internet service provider CADVision, Inc. charges $250 per month for an ADSL Internet access offering that features 7M bit/sec downloads and 1M bit/sec uploads — and no restrictions on use.

TeleChoice's Gage said it is not surprising that carriers are still feeling their way when it comes to DSL pricing given that the market is so new. She said customers can look forward to more uniform pricing as service becomes more prevalent and competition kicks in. ■

GTE gets ready to roll out DSL

GTE Corp. last week announced it will enter the digital subscriber line (DSL) fray by offering services in 30 cities by year-end.

At speeds ranging from 256K bit/sec to 1.5M bit/sec, DSL services can anchor corporate telecommuting networks as well as support Internet access over regular phone lines.

Starting in June, GTE will begin rolling out its service from more than 300 switching offices. Specific offices have been chosen because they serve corporations or universities that are likely to want DSL to support telecommuters, according to Jeff Bolton, GTE's senior group product manager for advanced data services.

GTE's rollout plan is ambitious, industry observers said.

"That's awfully aggressive. Even if they make just half of that, it will be a banner year for DSL," said Beth Gage, broadband analyst for TeleChoice, Inc., a consultancy in Verona, N.J.

GTE is the second monopoly local carrier to announce a major DSL service plan. US WEST is scheduled to have DSL services available in 40 cities by June (*NW*, Feb. 2, page 6).

GTE's DSL prices will vary depending on line speed, the number of lines ordered and the length of the service contract. The carrier's 256K bit/sec service will cost $30 to $40 per month for a single user, while the 1.5M bit/sec service will cost from $75 to $120 per month for a single user. The 1.5M bit/sec service will cost $186 to $250 per month for multiple users at a single site.

It will cost extra for customers using DSL to connect to the Internet or to a corporate network. GTE initially will offer DSL access to corporate networks over frame relay, and later, via ATM.

The DSL access link is significantly less expensive than alternative offerings, Gage said. A comparable 56K bit/sec frame relay link from a remote site costs $110 per month just for the port on a carrier switch. In addition, the customer has to pay for the physical access wiring and guaranteed minimum bandwidth, Gage said.

Initially GTE's DSL service will be available via switching offices in Beaverton, Ore., Durham, N.C., West Lafayette, Ind., and Redmond and Kirkland, Wash. Later in the year, the carrier will extend its offering to other switching offices in California, Florida, Hawaii, Illinois, Indiana, Kentucky, Michigan, Missouri, North Carolina, Ohio, Oregon, Pennsylvania, Texas, Virginia, Washington and Wisconsin. GTE's rollout plan is detailed at www.gte.com/g/news/adsl1041398.

GTE can be reached at (800) 483-4926.

— Tim Greene

ATM to get security boost

By Denise Pappalardo

Berlin, Germany

The ATM Forum this week expects to ratify a standard that could help users worried about ATM network security sleep better at night.

The ATM user and vendor group plans to finalize its ATM Security Specification 1.0 here at the forum's annual meeting.

ATM Forum's *Dobrowski foresees secure ATM-based services early next year.*

The specification details how ATM switch vendors can support user authentication, public-key encryption, data integrity and access control parameters on their devices, according to forum President George Dobrowski.

The ATM Security Specification 1.0 will ultimately enable users to buy secure ATM services from their carriers and maintain more secure private ATM networks.

The specification should also result in a more secure Internet, given that more Internet service providers are building their networks based on ATM gear, said Liza Henderson, senior broadband analyst at TeleChoice, Inc., a Verona, N.J., consulting firm. The improved ATM security could enable ISPs to provide more secure virtual private network, extranet and intranet services, she said.

The forum is not rewriting or defining security standards. Instead, it is outlining how ATM switches can handle existing security technologies such as X.509 digital certificates.

The specification does this by modifying ATM's signaling layer, which is used to initiate a connection with the traffic's final destination. By changing the signaling layer, the ATM switch now knows that if data is being transmitted with a digital certificate, for example, the switch must first verify the certificate before delivering the data.

Dennis Breen, net services manager for BB&T Co., of Winston-Salem, N.C., said he'll feel more comfortable sending data over carrier ATM-based networks if ATM equipment vendors implement the forum specification. Vendor support for the spec would let BB&T take more advantage of encryption or digital certificate technology, he said.

But even if the specification is ratified this week, users should not expect security-rich ATM services right away, Dobrowski said. It could take six to eight months for ATM product vendors to incorporate the security specification into their software. ■

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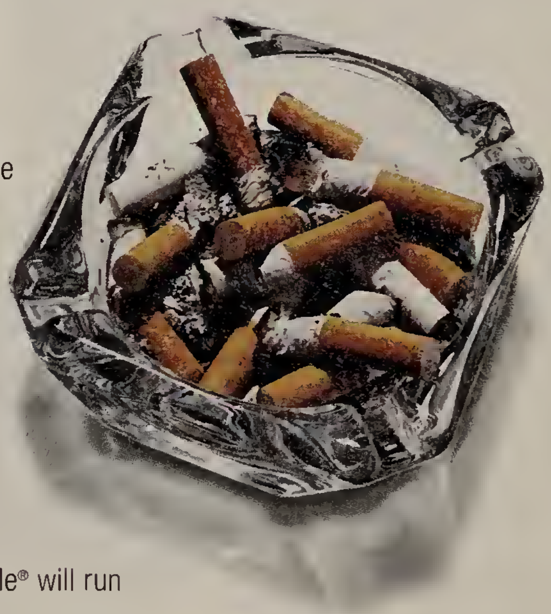

Sun microsystems

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Mobile NCs driving slowly towards market

By Chris Nerney

The stalled mobile network computer (NC) effort may get a jump-start later this year when Oracle Corp. ships what could be the first device from a major Java proponent.

The company's Network Computer, Inc. (NCI) subsidiary intends to unveil a sub-$1,000, Java-based mobile NC that can be used by field workers or act as a dial-up hub in remote offices.

What's inside mobile NCs

Under the current specification drafted by the Mobile Network Computer Reference Specification Consortium, mobile NCs will include the following:

Hardware

- CardBus
- Universal serial bus
- Serial port
- Parallel port
- Monochrome screen, minimum resolution 320 by 240 pixels, 2 bit/pixel (color optional)

Software

TCP/IP-based standards

- TCP
- IP Version 4
- User Datagram Protocol
- PPP

Optional IP standards

- Network File System
- File Transfer Protocol
- Telnet

Smart card technology (optional)

Support for:

- HTML 3.2
- Teleconferencing of video, data or both
- LANs, WANs, wired or wireless connections
- Simple Mail Transfer Protocol
- Network News Transport Protocol
- Java Naming and Directory Interface

The device is expected to be based on standards announced nearly a year ago by a consortium of hardware and software makers.

Implementing the standard hasn't been easy. When a multi-vendor group announced the standards effort last June, members hoped to adopt a final specification in a few months and start shipping products within a year. But the Mobile Network Computer Reference Specification (MNCRS) Consortium only last month released a draft specification, and the final version may not be out until September.

NCI will not build complete devices, but will instead package its mobile NC software with hardware from a variety of American and Japanese OEMs.

NCI could offer different kinds of mobile NCs to meet the specific needs of field workers, said Jeff Menz, NCI's director of product management. Employees doing simple data entry in a warehouse, for example, wouldn't need large screens and full keyboards, while sales professionals would.

More complex Java-based NCs will have proxy caching capabilities, Menz said, "so you have the ability to disconnect from the network and still do some fairly interesting things with Web pages or JavaScript."

NCI also intends to include smart card technology in all of its mobile NCs, although smart cards are optional under the draft specification. Users would have to insert their smart cards into the NC to provide identification information before being connected to the network.

Others slow to move

Two other leaders of the network computer working group, Sun Microsystems, Inc. and IBM, said they have no immediate plans to ship Java-based mobile NCs.

Sun won't have mobile NCs on the market until sometime next year, company officials said. And an IBM source said "it's too early to pinpoint when we will also introduce a mobile NC."

One analyst said the delay in rolling out mobile NCs isn't surprising. "There's been too much talk in the NC market, and not enough action," said Eileen O'Brien, of International Data Corp., a market research firm in Framingham, Mass.

Noting that "it will be at least a year and a half since the [mobile NC] specification was announced before we see a product," O'Brien said the wait will make it more difficult for "businesses to buy into the NC concept."

The mobile specification is an extension of the Network Computer Reference Profile, a set of protocols agreed to by Sun and its Java/NC allies in 1996 to provide a common platform for mobile NCs.

Sun officials said the company is working on two different kinds of Java-based mobile NCs.

One is aimed at enterprises in campus environments such as hospitals, where doctors and nurses making rounds need quick access to patient information, said Ameet Mehta, marketing manager of Java-based mobile products for Sun Microsystems Computer Co., a unit of Sun.

"This is a market where users run the same application over and over again," Mehta said. As such, the device would need only enough memory to store an operating system and the main application and would have a wireless connection to the network.

The second mobile NC product being developed at Sun is aimed at road warriors. This device would need more caching space because such employees frequently need to work on the NC when it is disconnected from the network.

Meanwhile, a company that is not part of the MNCRS group may launch a Java-based mobile NC in September.

Concept Technologies, a division of the British company Hugh Symons Group Plc., plans to sell its product, called Pic Pocket, for about $1,000.

Toshiba Corp. already has introduced a mobile NC into the Japanese market. ■

AT&T

Continued from page 7

mail-order locations in Tempe, Ariz., and Orlando — ordinarily on the AT&T network — had backup frame relay capacity with MCI. "But we can't afford to have dual networks in stores," Sheedy said. "And ISDN is too expensive in stores and not available everywhere."

Many analysts did offer AT&T some sympathy, blaming Cisco's StrataCom BPX ATM switches with a frame relay access concentrator shelf as the likely culprit in the outage. In a statement, Cisco said it was working closely with AT&T to resolve the problem, but would not comment further.

Most analysts discounted the possibility of lightning striking twice in the same place. But the longer the root cause is not discovered, the greater the concern that a similar problem could occur. Steve Sazegari, president of Tele.Mac, a Foster City, Calif., consulting firm, noted that data traffic typically spikes on Monday — the day this outage occured — as order entry systems reflect weekend mail orders and transactions.

"These switches were never put under this kind of test in the public network before," Sazegari said. "I think a fiber cut would have been a lot less devastating for people. The interruption would have been one or two or three minutes because they would have rerouted around the problem, and the rest of the network would not have been affected." ■

It takes a village to build a faster backbone

Universities demonstrate Internet2-bound image and video applications.

By Denise Pappalardo

Washington, D.C.

The federal government, leading-edge universities and network industry chiefs last week joined to announce they would all pitch in to build a high-speed pipe through cyberspace.

With Qwest Communications, Inc.'s Joe Nacchio and MCI Communications Corp.'s Vinton Cerf at his side, Vice President Al Gore announced that Qwest is donating 16,000 route fiber miles of its OC-192 network to help build Abilene, the network backbone for Internet2.

Internet2 is a project initiated by the University Corporation for Advanced Internet Development and backed by the Clinton administration.

The project, which ultimately will provide a faster alternative to today's Internet, includes over 110 research universities.

The goal of Internet2 is to support advanced applications based on emerging technology for academic researchers and teachers. Nortel and Cisco Systems, Inc. are also donating equipment to support the nationwide network.

Representatives from universities around the country gathered here to demonstrate bandwidth-intensive applications that require the high-speed network Abilene is designed to support.

STAN BAROUH

Vice President Al Gore *backs Abilene, the latest educational network.*

The network is expected to support speeds up to 9.6G bit/sec.

Some of the applications, such as the University of Missouri's Distributed Image SpreadSheet, are currently running over the very high performance Backbone Network Service. The application is a weather modeling tool that uses satellite imagery to compile statistical data for the National Oceanic and Atmospheric Administration and NASA. This application transfers files that are up to 10G bytes.

Other university projects, such as the Pathology Image Classification and Retrieval application, from Carnegie Mellon University's Pittsburgh Supercomputing Center, will be dependent on Internet2's Abilene network.

"The guaranteed delivery of images at high speeds is essential to the project," said Arthur Wetzel, research programmer at the Carnegie Mellon.

The Pathology Image Classification and Retrieval application will have numerous and far-ranging uses, proponents claim.

For example, small hospitals, as well as those in rural areas, will be able to instantly compare tissue samples of their patients with those contained in a national database. This procedure would allow the facilities to provide a faster and more expert analysis and diagnosis. ■

IBM targeting remote users with new integrated packages

Company to bundle routers with AS/400 and RS/6000 server families.

By Marc Songini
Raleigh, N.C.

IBM's Networking Hardware Division (NHD) is trying to bolster an area the company has been notoriously weak in — remote access.

IBM executives last week said they would start selling the company's servers bundled with routers and other networking gear in an attempt to be a one-stop shop for users looking to set up remote offices.

The plan would also simplify what has been a notoriously complicated sales and systems integration process. Currently, most of IBM's networking and server gear is sold by different parts of the IBM sales force. Consequently, users are often forced to deal with a dizzying array of systems integration issues when purchasing IBM products.

Jose Garcia: *IBM's NHD will reach out to workgroups without sacrificing enterprise.*

Under the new IBM plan, the company will package its low-end 2210 Nways router with its AS/400 mid-range and RS/6000 servers and software. Other net gear, such as network interface cards, could also be tossed in as needed, company officials said.

IBM last week rolled out its first packaged offering — a NetFinity PC server coupled with the 2210 router. The idea behind the NetFinity/2210 combination is to provide a single integrated package that branch offices can implement quickly, said Jose Garcia, business line manager of the newly created workgroup network unit at NHD.

Added security

Officials also revealed that IBM will be adding IP Security (IPSec) to the 2210 and IBM's other routers, such as the 2216. IPSec is an emerging industry standard for data encryption and key management that can help build virtual private networks (VPN).

Garcia said IBM wants the routers to be anchors that remote users can deploy to build secure VPNs.

Also for the remote user, IBM will add dial access capability to the 2210 and 2216. However, IBM did not define the dial-in technology it will use to deploy that feature.

Executives at IBM believe that most of the growth in the LAN market over the next few years will be generated from sub-1,000 seat networks. As a result, the company is attempting to woo remote workgroup users. At the same time, however, the company will continue its emphasis on supporting large enterprise users.

IBM hopes its moves in the remote access market will make it more competitive with Microsoft Corp. and Compaq Computer Corp., two vendors that lead the market in offering prepackaged server software and network hardware.

"These are anti-Microsoft moves," said Cindy Borovik, an analyst with International Data Corp., a research firm in Framingham, Mass. Adding remote connection support to NetFinity and the AS/400 lines makes sense, she added. ■

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Testers get glimpse of Netscape's Aurora

By Andy Eddy
Mountain View, Calif.

Netscape Communication Corp.'s Communicator source code giveaway includes a nice little treat — a sneak peak at Aurora.

The Aurora software is designed to do two things. First, it allows Netscape to add local and network data access to the company's browser. Second, and much more visible in the test code, is Aurora's ability to provide a richer view of Web resources.

Microsoft Corp., meanwhile, is accomplishing some of the same 'Net goals by including a browser with its operating system in Windows 98.

While the source code found on Netscape's Mozilla site can be compiled into a program that runs, it is still awfully raw. One developer called it "ugly code."

Despite its rough edges, the Mozilla-related newsgroups (netscape.public.mozilla.* at news.mozilla.org) are buzzing with comments from those playing with the Aurora source code. Jason Kersey, a Web page designer in Hudson, Ohio, has had some time to dabble with Aurora using a compiled version under Windows, and reported a mixed reaction.

Besides presenting bookmarks in tree form, Aurora can display a history of sites visited the same way, according to Kersey. At present, Aurora can display a list of visited sites by date, or break the list down by URL (and sub-pages visited within that domain). Kersey said he thinks the history could be expanded to offer a wider variety of display choices.

He also described Aurora's ability to display a "map" of a Web site, which basically shows the structure of a site in tree form, much like the current structure of bookmarks in Communicator 4.0. The map provides a visual display of the site and makes it easy to move directly from one page to another, regardless of how many levels are between them, and without having to navigate one level at a time.

Here's how Aurora builds a site map. A "metatag" in the HTML coding points to the location of the map information for the site, and if Aurora detects that tag, it will build the site map from the related information.

Obviously, sites that are constantly changing need to dynamically update the site map information or Aurora won't be able to display an accurate map. At present, only a few sites, such as mozilla.org, HotWired and *The New York Times*, are providing this site map data.

Local looks

Aurora will eventually offer the ability to navigate local files as well as remote sites, although this is not supported in the current release of the source code. In effect, the browser can work as an operating system shell. Aurora will help the user navigate through such diverse document types as Web pages, e-mails or word processor files.

Microsoft is making a similar move with Internet Explorer 4.0 on Windows 95 and with the browser integration contained in Windows 98.

Netscape expects to get Aurora into the hands of users with its next version of Communicator, slated for release by year-end.

However, Netscape officials talk about Aurora as something that will slowly evolve over time.

"It's not ready for prime time. It's not even really at a beta level," said John Gable, a Netscape product manager. "[At this point, it's] really a long-term direction. Some of the pieces you'll see [in Communicator Version 5.0], and some you won't see." ■

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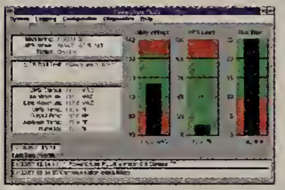

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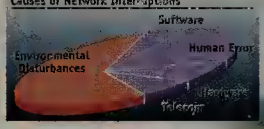
With more than half of all network interruptions the result of an environmental disturbance, the care you take in housing your equipment is just as important as the care you take in choosing the right server. APC NetShelter and Smart-UPS line of rack-mount UPSs, power management software, and environmental monitoring accessories create a secure, manageable and reliable environment for your network equipment.

Causes of Network Interruptions



source: *Contingency Planning*

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NetShelter's environmental and security features prevent downtime and provide peace of mind. To plan an installation or to order NetShelter, call the Free Rack Configuration Center at 1-888-RACK-APC and an APC expert will help design a perfect solution.

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Custom-tailor your NetShelter to meet the needs of mixed-server environments with APC's extensive line of NetShelter accessories, many of which come standard with enclosure purchase.

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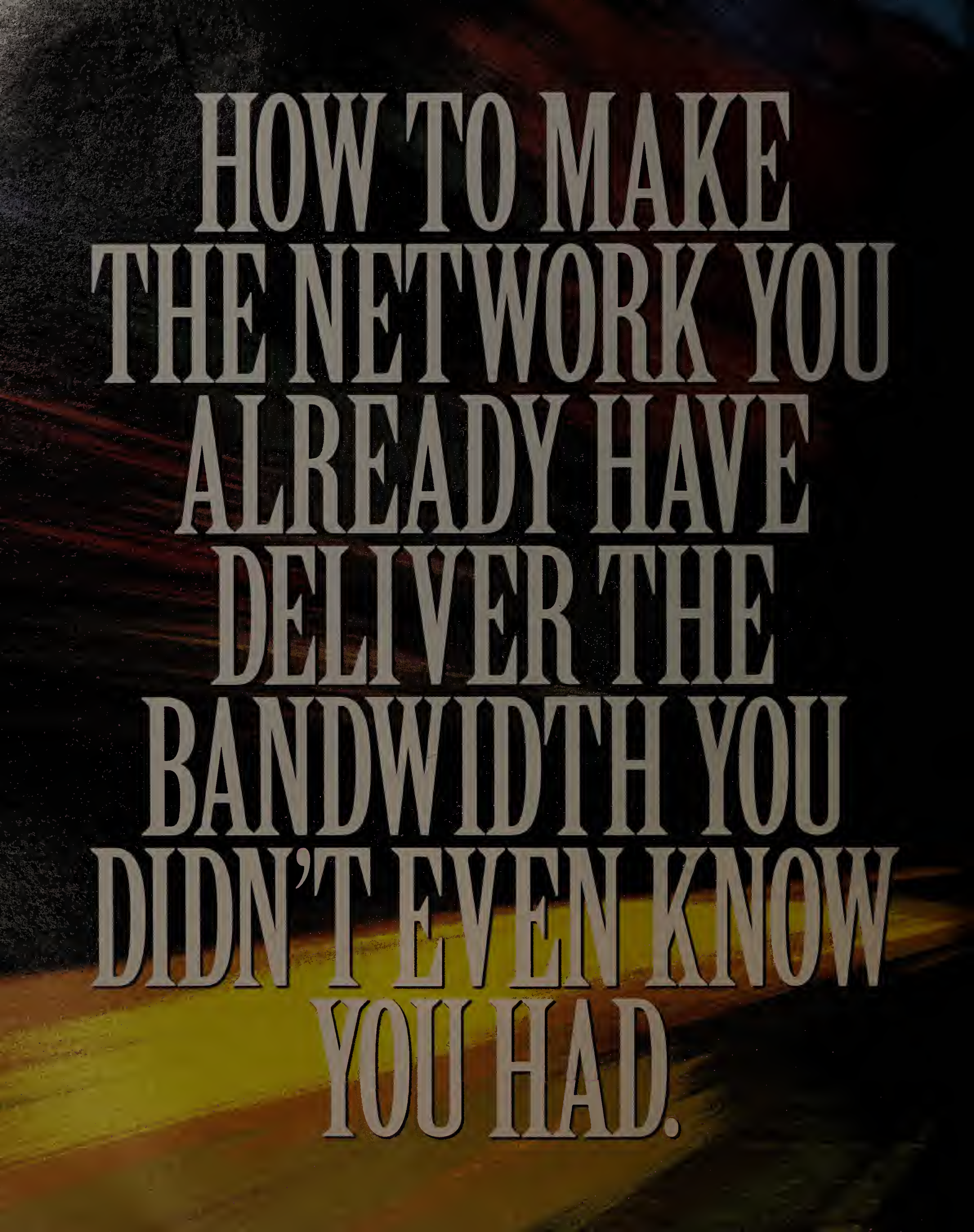

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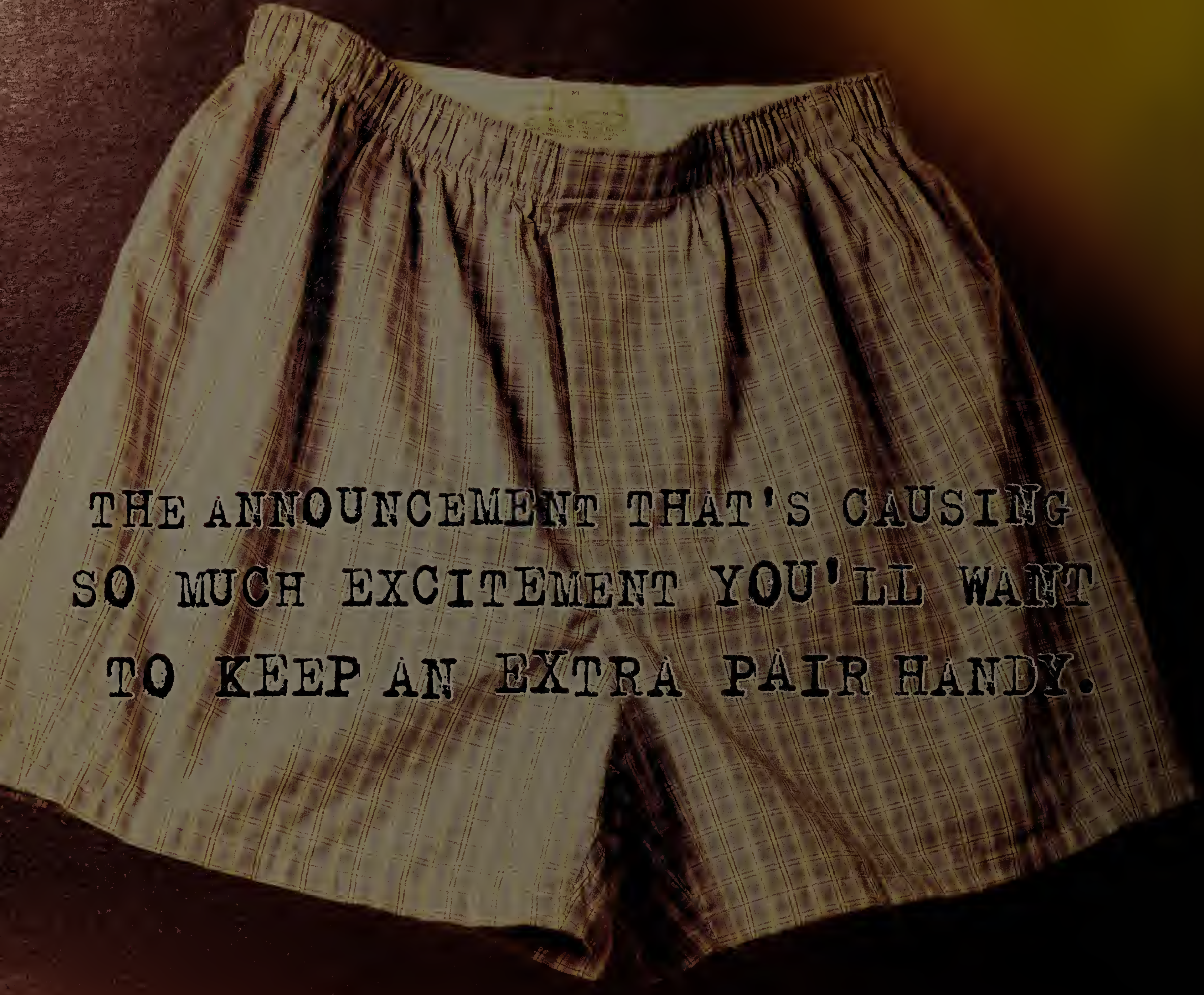
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Local Networks

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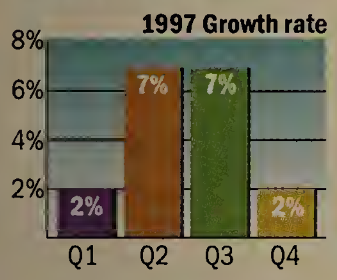
Briefs

■ Market research firm **In-Stat** *has reported that market growth for* **LAN switches and hubs** *appears to be slowing down. The market grew only 2% during the fourth quarter of 1997 to $2.68 billion, while the market grew 7% in each of the two preceding quarters. The Scottsdale, Ariz., company found that switch sales were up 28% in the fourth quarter vs. the third quarter, but that hub sales fell by 11%. The survey also found that 68% of switch ports sold during the fourth quarter were for fixed configuration devices, while 55% of switch revenue was generated by high-end, modular devices.*

✆ In-Stat: (602) 483-4440

HUB AND SWITCH MARKET GROWTH SLOWING



■ **3Com Corp.** *last week announced that an upgraded version of its DynamicAccess software, which brings* **intelligent management services** *to network interface cards (NIC), can be downloaded for free at www.3com.com. DynamicAccess 1.5 is available for 10/100M bit/sec desktop NICs, Fast Ethernet and Gigabit Ethernet server NICs, and mobile PC Cards.*

Separately, 3Com last week introduced its SuperStack II Hub 1000 SX, an eight-port **Gigabit Ethernet hub.** *The device is a hybrid of a switch and a repeater, allowing full-duplex packet forwarding at 1G bit/sec.*

3Com guarantees that the device will be fully compliant with the IEEE 802.3z Gigabit Ethernet standard. The hub costs $799 per port.

✆ 3Com: (800) 877-2677

Start-up to simplify mgmt. of thin-client nets

Lakeside Software to debut SysTrack package for managing Windows NT Server 4.0 Terminal Server Edition servers.

By John Cox
Chicago

Start-up Lakeside Software, Inc. this week will introduce badly needed software for managing thin-client networks based on Microsoft Corp.'s multiuser version of Windows NT.

The software, called SysTrack, will enable MIS groups to track which applications are being accessed by terminal users who are tied into servers running Windows NT Server 4.0 Terminal Server Edition (TSE).

In addition, companies will be able to use Lakeside's software to monitor how frequently applications are being used and to see which end users are accessing the programs.

Companies rolling out Microsoft's thin-client technology, which enables terminal users to access applications on a central NT server, can use the information collected by SysTrack to determine how big their multiuser NT servers should be. SysTrack can also be used to measure how much memory and disk storage is needed and how many terminal users each server can handle.

"Our support manager said that if we sell a WinFrame [or TSE] server without including SysTrack, he'll kill us,'' said William Botti, president of Computer Networks, Inc., a Pleasanton, Calif., systems integrator. Computer Networks, which has been testing SysTrack since last November, has found the software to be reliable.

The Lakeside product, which will be announced at Comdex/Spring '98 here, can also manage servers running Citrix Systems, Inc.'s WinFrame software, which is the technology at the heart of TSE. Additionally, SysTrack can be used to manage standard NT Server machines.

What's inside SysTrack

SysTrack has three components: the Data Collection Agent, a database and analysis/reporting tools.

The Data Collection Agent runs as an NT Service on a TSE server and collects data about CPU and memory use, and user and disk activities, according to Michael Schumacher, president of Lakeside, which is based in Waterford, Mich. The agent then stores the data in an Open Database Connectivity-compliant database. Network administrators can then access this data using analysis/reporting tools from a Windows PC or terminal.

SysTrack provides users with an activity history that's almost impossible to create with existing NT tools, Botti said.

''Today, you can't tell what happened unless you're looking at [network activity as it happens],'' he said. By contrast, SysTrack collects data that Botti can use to see why a server was so slow at 8 p.m. the night before, or whether lack of memory was the primary limitation during peak usage.

Companies can use SysTrack to set up alert thresholds and warn administrators via a pager or e-mail that a TSE server may be about to run out of memory or that CPU use is near maximum.

SysTrack, when released May 10, will cost $1,495 per monitored server.

✆ Lakeside: (800) 969-7717

LAKESIDE SOFTWARE'S SYSTRACK

What it is:	Software for managing applications on servers running Microsoft Windows NT Server 4.0 Terminal Server Edition or Citrix Systems' WinFrame.
What it does:	Analyzes application loads; tracks and records user activities; creates billing reports; monitors servers in real time; stores historical data.
Requirements:	NT Server 3.51 or higher or Citrix WinFrame on the server; Windows 95 or 98 on the PC-based management station.
Price:	$1,495 per monitored server.
Availability:	May 10, 1998.

6722

- A Windows NT Server 4.0 Terminal Server Edition overview and FAQ
- White papers from thin-client vendors

www.nwfusion.com

Compaq lowers prices on server, network gear

Observers say company needs to unclog its reseller channels.

By Marc Songini

In the latest round of one-upmanship in the server market, Compaq Computer Corp. has sliced the base price of its mid-range Windows NT server by 6% and dropped the price of server options by up to 36%.

The PC server market leader said that it is making the price cuts to stay competitive with rivals, such as IBM and Dell Computer Corp., that have also made recent cuts. But industry observers said Compaq is cutting its prices to drive sales of products that are clogging up its channels.

The server price cuts come at a time of sluggish growth for the PC server market as users hold off on buying current models while they wait for machines based on 64-bit Merced chips and running Windows NT 5.0. The PC server market grew just 8% from the third to fourth quarter of 1997, according to International Data Corp., a market research firm in Framingham, Mass.

Compaq has cut the base price of its 1600 ProLiant server from $3,637 to $3,410. The server boasts a 300-MHz Pentium II processor, 512K bytes of cache and 64M bytes of memory. The company has also reduced the price of extra memory by 36% and hard drives by 22%.

Compaq cuts deep

Product	New price	Price cut
1600 ProLiant server	$3,410	6%
10/100M bit/sec 2724 hub	$1,632	13%
10/100M bit/sec 5708 Ethernet switch	$1,572	34%
4/16M bit/sec token-ring PCI NIC	$227	11%

Net gear savings

In addition, the company has slashed prices on its remote access products, switches, hubs and network interface cards (NIC).

Industry watchers said that making such price cuts is a necessity in this increasingly competitive and price-sensitive market.

Compaq trimmed the price of its 24-port 2724 hub, a device with speeds of 10/100M bit/sec, by 13% to $1,632.

The company also reduced the price of its 4/16M bit/sec token-ring PCI NIC from $255 to $227.

✆ Compaq: (800) 345-1518

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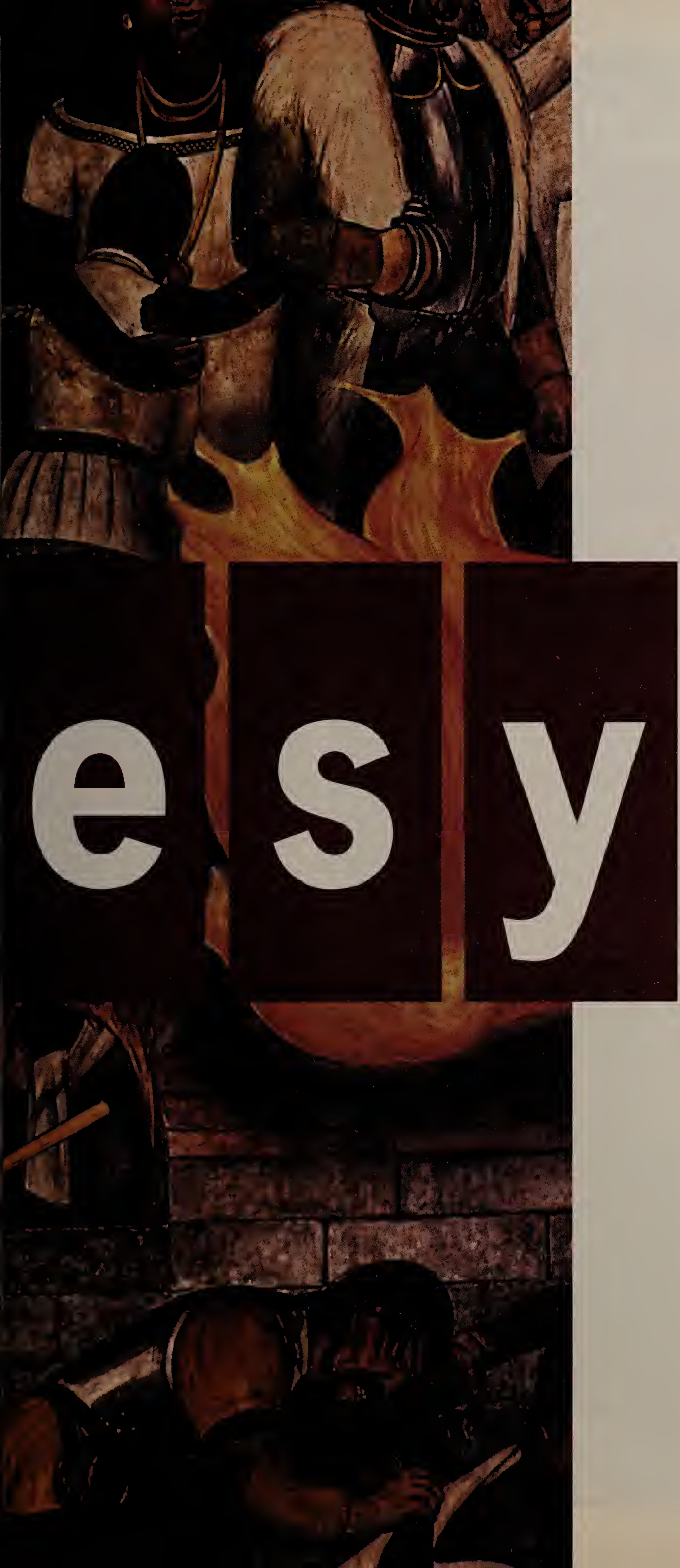

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DIGITAL Creation Studio comes Intel and Alpha-based (to 333 and 500MHz), and yes, it can interoperate with Macs.

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WIRED WINDOWS

We don't need no stinkin' backups

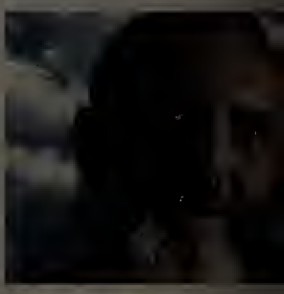
One of the recurring nightmares I had as a network administrator came to life last month. Fortunately for me, I wasn't the victim. Stanford University was, at least according to a story in the *San Jose Mercury News*.

The Stanford University Graduate School of Business lost some computer files, among which were irreplaceable items such as databases that took months to build, notes of crucial research, and parts of dissertations and books that had been in development over a number of years. Approximately 15 faculty and Ph.D. candidates out of 200 using the affected server lost all of their work.

The incident occurred when two network servers at the Business School were moved to the computation center. At the same time, technicians increased the disk capacity of each. When rebooted, one refused to recognize any files on its disk storage. The problem was then compounded as the technicians restored a partial backup that overwrote much of what was on the disk.

I sincerely hope you all caught the four errors that were committed by the people involved in this fiasco.

First, no backup was done before moving the server or changing the disk configuration. Kearns' first law of server maintenance is, always do a full, complete, verified backup before opening the case. The corollary to this law: Better get two backups, in case Murphy is doing the first one. Most administrators agree with this, but it's surprising how many of them don't realize that for most server installations, open files don't get backed up. The only way to ensure a full, complete backup is to disconnect all users and shut down all services except those actually needed for the backup.



Dave Kearns

The second error was attempting to make two changes at the same time — moving the server and increasing disk capacity. When you make a change that has the possibility of causing damage, you should always reboot before trying another change. In that way, you can more easily isolate the possible causes of the failure and have a better chance of recovering from it.

The third error occurred when the technicians attempted to restore a backup copy without verifying its completeness and, in the process, trashed any recoverable data on the drive. It's evident that someone panicked and scrambled to try to set things right before anyone else noticed — a really bad idea.

The fourth error, of course, was the total lack of planning involved.

Now would be a very good time to review your disaster plan so you'll be ready when — not if — disaster strikes.

Kearns, a former network administrator, is a freelance writer and consultant in Austin, Texas. He can be reached at wired@vquill.com.

Tip of the week

Global Technology Associates, Inc. has released a free, limited version of its firewall software, called GNAT Box Light. In this free version, the number of hosts and connections are limited, but GNAT Box Light will permit users to run a small network or test bed utilizing all the capabilities of feature-complete GNAT Box software. GNAT Box Light can be downloaded free of charge via the GNAT Box Web site at www.gnatbox.com.

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Call today for a FREE 30-day evaluation copy of CyberGuard™ Firewall for Windows NT, and discover the most secure, easiest to manage and most cost-effective* network security solutions available anywhere.

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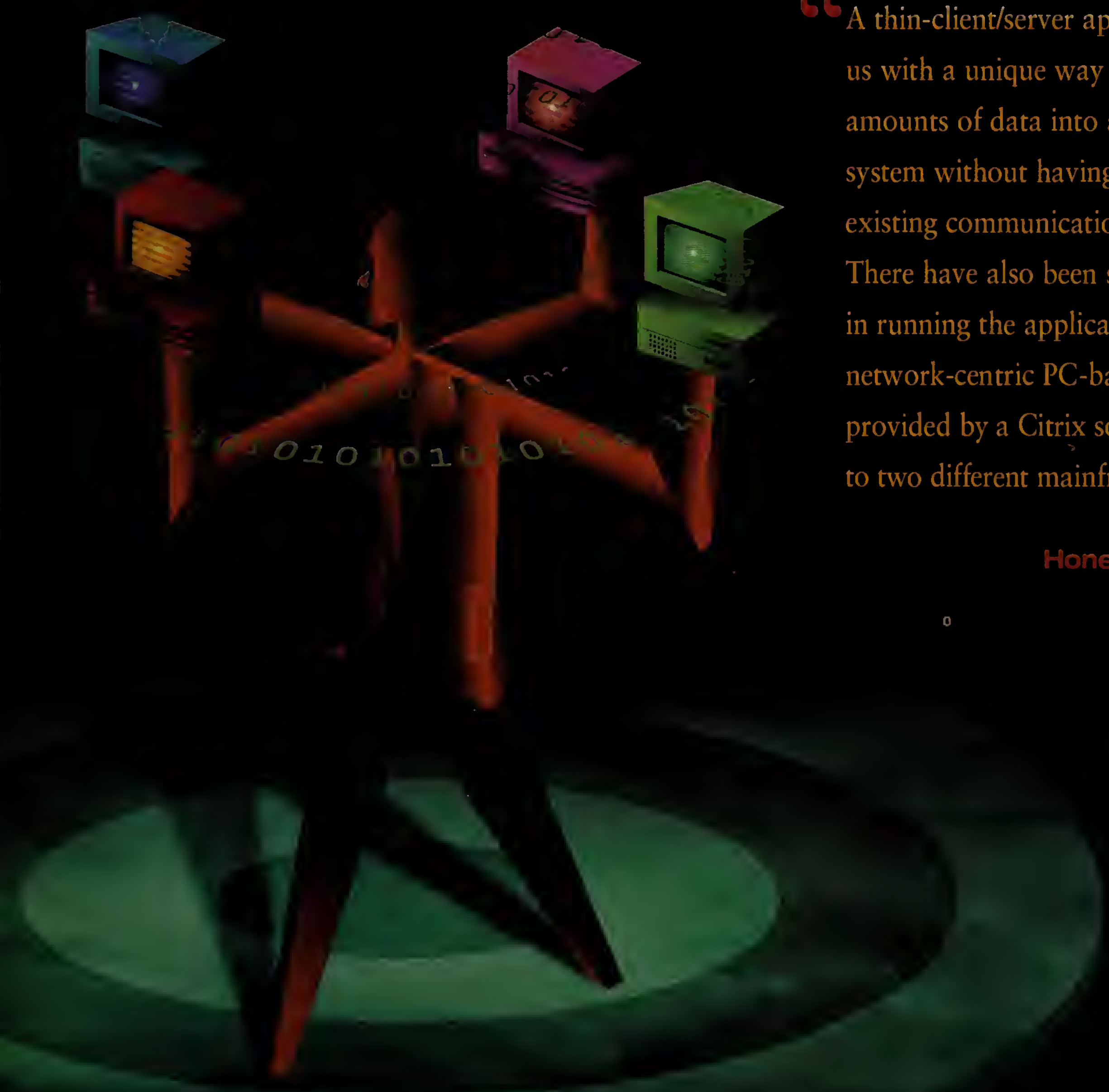
Thin-Client/Server Computing

Reducing the costs and complexities of application deployment, management, access and use.

"A thin-client/server approach equipped us with a unique way of entering large amounts of data into a Windows-based system without having to upgrade the existing communications infrastructure. There have also been significant savings in running the application using a network-centric PC-based technology, provided by a Citrix solution, as opposed to two different mainframe systems."

**Marc Maertens,
Honeywell Europe S.A.**



CITRIX®

Thin-Client/Server Computing Takes Your Enterprise Further

When *Fortune* magazine recently named the "10 Tech Trends To Bet On," its number-one pick was centralized computing. But as you centralize, the question remains: What is the most efficient and cost-effective way to get there? Is there an existing technology that will do the job? Or will you have to wait for something new—and untested?

The solution that more and more companies are turning to is thin-client/server computing. It's available today. And it's from Citrix Systems, Inc.

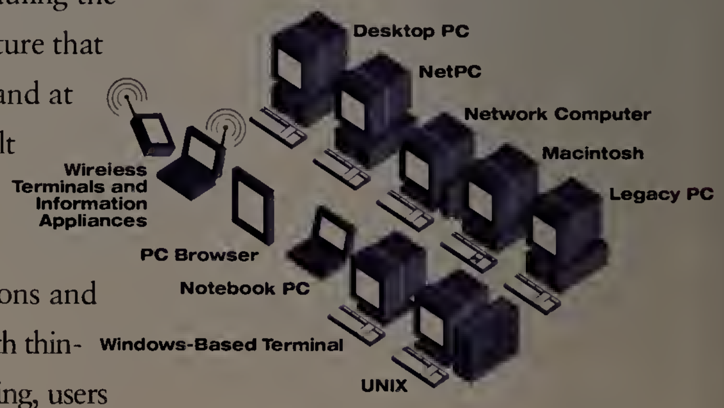
> "It turned out that our office saved around $6 million because Citrix software could help us do more with less available resources."
>
> **Truman Legg,**
> **Public Defender's Office, Orange County, CA**

With thin-client/server computing, you can extend your resources further than ever before. Because applications and data are deployed, managed, supported and executed 100 percent on the server. And client devices, whether "thin" or "fat," have instant access to these applications. Sessions run concurrently on the server, without sacrificing application performance.

Thin-client/server computing is not about devices or operating systems. It works with everything from the latest Pentium®-based PCs, to powerful workstations, Java™ network computers and legacy PCs. It's not about replacing or overhauling the network infrastructure that you've carefully—and at great expense—built up over the years. And it's not about scrapping applications and rewriting code. With thin-client/server computing, users have access to the latest 16- and 32-bit Windows® applications, from any device, from anywhere—even over dial-up connections—with performance that goes beyond conventional networks.

Join industry leaders

Industry leaders and users alike are rapidly recognizing the strengths of the Citrix thin-client/server computing approach. Last year, Microsoft licensed Citrix® MultiWin™ technology to create a multi-user version of Windows NT® Server 4.0 and future versions of Windows NT. IBM, Hewlett-Packard and other strategic partners have licensed Citrix ICA® (Independent

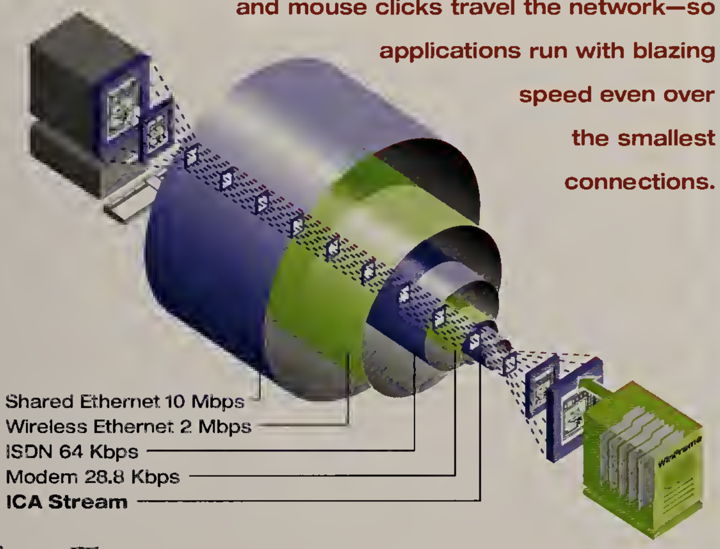


Citrix provides high-performance, thin-client software solutions that allow any client to access 32-bit Windows-based applications.

Computing Architecture), enabling any client to access Windows-based applications on the servers. Today, Citrix Systems has an installed base of over one million concurrent user ports servicing over three million users daily in companies like R.R.Donnelley, Honeywell and Bell Mobility.

Citrix is the answer

Why are more and more organizations choosing thin-client/server computing? 1) It's available right now, 2) it can reduce the complexity of your network so you can lower your total cost of ownership—by as much as 57 percent*—and 3) it offers enhanced benefits to IT managers and end users.



With ICA, only screen updates, keystrokes and mouse clicks travel the network—so applications run with blazing speed even over the smallest connections.

Management and scalability: Using thin-client/server computing, IT professionals can deploy, manage and support applications from a single location in minutes across a network of any size.

Access: Users can access 32-bit Windows-based applications from virtually any client device, including legacy 286, 386 and 486 PCs, Pentium-based computers, network computers, Windows-based terminals, UNIX® workstations and Macintosh® systems.

Performance: Thin-client/server computing can provide LAN-like application performance and superb responsiveness, even over low-bandwidth connections.

Security: Thin-client/server computing keeps vital information on the network and offers everyone access to the same centralized information.

With thin-client/server computing, you'll be able to make the most of your technology investment. Network and staff efficiency goes up while reliance on new hardware and technology goes down. The result? You lower your total cost of computer ownership.

WHAT IS A WINDOWS-BASED TERMINAL (WBT)?

You choose the right client for your needs.

One of the beauties of thin-client/server computing is the flexibility it provides for selecting client devices. Because in thin-client/server computing it's the function that's important, not the hardware.

Which device? A thin-client/server client device can be any network-connected system accessing a Windows-based application executing on a server.

Either "fat" or "thin." It doesn't matter whether the client system is a full-featured "fat" computer, like a desktop, notebook, workstation, or Java-based network computer, or whether it's a "thin" client, like a Windows-based terminal (WBT), or wireless information appliance.

With any O/S. It doesn't matter whether the client uses the Windows operating system, or a non-Windows-based platform like DOS, UNIX, Java, Mac OS or OS/2®.

From any site. And it doesn't matter whether the client is at headquarters, in a branch office, at home, in a hotel, airport or anywhere else.

Same Windows performance. With Citrix thin-client/server computing, everyone gets the same familiar look and feel of Windows and the same high performance from applications. But they have the ability to select the client device that best meets their individual needs.

Citrix Provides Robust Solutions For Thin-Client/Server Computing

The Citrix family of thin-client/server computing solutions have been specifically designed to help take your enterprise computing further—toward the connectivity and manageability you want. They're the highest-performing, most cost-effective and most secure way to deploy, manage and access business-critical applications across your enterprise network.

Now both administrators and end users can do their jobs more easily—and better. And you get a better return on your existing infrastructure.

Citrix thin-client/server solutions extend Windows-based applications. In fact, Microsoft Corporation has licensed Citrix multi-user technology and endorsed Citrix thin-client/server technology.

Citrix solutions provide three key benefits:

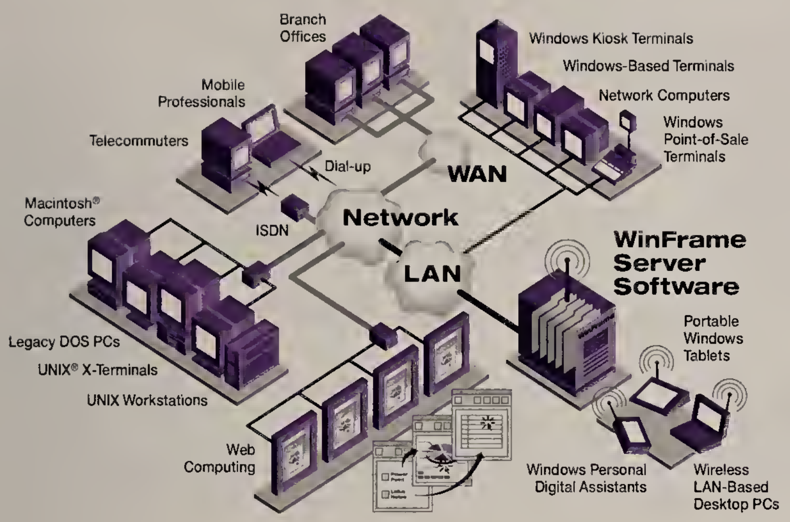
- **Heterogeneous computing environments:** Finally, you can make Windows-based applications available to everyone—and still let users keep their desktop of choice. Citrix solutions support all types of hardware, all types of operating platforms, all network connections and all LAN protocols. Your network can reach further, because it's not limited by your existing equipment.
- **Enterprise-scale management tools:** Citrix thin-client/server products give you enhanced management tools for applications on Microsoft® Windows NT-based networks. You can easily add servers without reconfiguring systems, administer applications across multiple servers from a single point and protect vital data and applications on the server.
- **Seamless desktop integration:** When you employ a Citrix thin-client/server solution, users enjoy the familiarity of a local desktop even though applications are running from the server. So the need for training is decreased and productivity is increased.

And because thin-client/server computing offers bandwidth-independent performance, local users can experience improved application performance, even when network traffic is heavy.

Extending Windows NT

The popular Citrix WinFrame® family of solutions already is enabling over 3,000 businesses worldwide to provide enterprise-wide access to Windows-based applications. The newest member of the Citrix family is the "pICAsso" Project, which received the *BYTE* magazine "Best Networking Tool and Application" award at COMDEX/Fall 1997.

> "Like a kid in a candy shop, physicians and their staff have applications at their fingertips."
>
> **John Ernst, Clarian Health**



With Citrix thin-client/server solutions, access to Windows-based applications is available to users with varied needs, across a broad range of locations.

Complete product family

1997 BYTE EDITOR'S CHOICE AWARD

The Citrix family of robust products ensures the best in application access, performance, manageability and security. Each meets the needs of demanding enterprise environments—providing the most advanced thin-client/server functionality in solutions designed to keep your business productive and efficient. And they work today.

CITRIX FAMILY KEY FEATURES AND BENEFITS

Feature-rich Citrix solutions provide connectivity for heterogeneous computing environments, enterprise-scale management tools and seamless desktop integration.

Any client device. Citrix makes thin-client/server computing possible using virtually any client device, including PCs, terminals, network computers and wireless devices.

Any connection. Citrix solutions can make connections over telephone lines, wireless devices, the Internet and more, making it ideal for extending bandwidth-hungry applications to users.

Application publishing. Administrators can easily deploy applications across multiple servers from a single point.

Application launching and embedding. Windows-based applications can be launched from or embedded into HTML Web pages.

Load balancing. For optimum application performance, administrators can group servers into "farms" and route users to the least-busy server.

Session shadowing. Administrators can see a user's display or control the mouse and keyboard, for easy support and training.

Local/remote clipboard. Users can cut, copy and paste between applications running on the server or desktop.

Drive mapping. Users have complete access to disk drives. Data from a server application can be saved to a user's local drive.

Printer mapping. Users can transparently access local printers. Mobile users can print remotely.

Port mapping. Peripherals can be accessed by applications running remotely from a server.

Audio support. Sound Blaster® Pro audio support makes a Citrix solution the ideal tool for education, training and the Internet.

Industry-Leading Partnerships Deliver Solutions You Can Trust

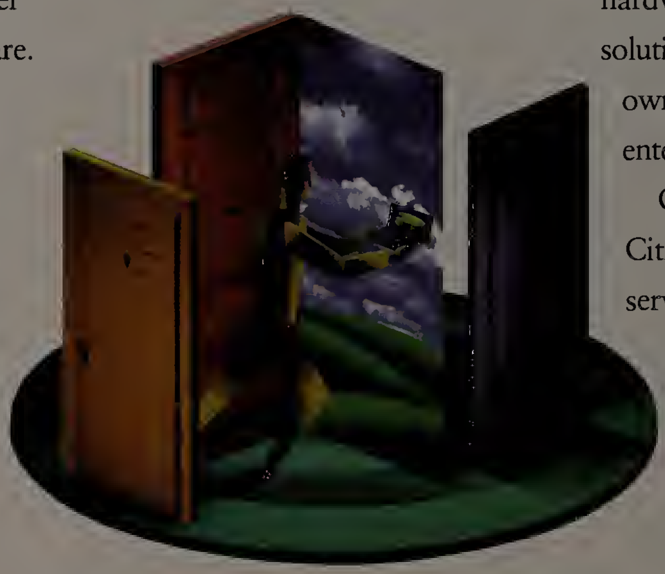
Every so often, a big idea comes along that everyone wants to get behind. And thin-client/server computing is one of those ideas. The Citrix Business Alliance is enrolling a growing number of industry leaders to focus on delivering reliable, scalable, cost-effective solutions for business-critical enterprise computing.

Through these partnerships, Citrix works to ensure that its thin-client/server technology functions seamlessly with other vendors' hardware and software. These partnerships are also working to create future products that will help you take full advantage of the benefits of thin-client/server computing.

Microsoft

The recent joint development agreement between Citrix and Microsoft Corporation represents a key partnership. But Citrix and Microsoft have been partners for years. In developing its WinFrame solution, Citrix licensed Windows NT source code, which serves as the base operating platform for the thin-client/server software.

In the development agreement, Microsoft licensed Citrix technology that provides multi-user capabilities for Windows Terminal Server. This multi-user server core provides the ability to host multiple, simultaneous client sessions on Microsoft Windows NT Server 4.0.



Industry partnerships ensure the development of new products that give you more ways to use Citrix solutions.

Compaq

A worldwide joint marketing agreement between Citrix and Compaq Computer Corporation promotes the benefits of thin-client/server computing to customers and channel members. These initiatives feature Citrix WinFrame thin-client/server software and Compaq® server hardware as an advanced solution to lower the cost of ownership for mission-critical enterprise computing.

Compaq has also included Citrix WinFrame thin-client/server software as an option in its innovative SmartStart™ program, an integration tool that optimizes platform configurations and simplifies the installation of servers and software. Inclusion in the SmartStart program simplifies configuration and lowers WinFrame's installation time on Compaq servers.

Hewlett-Packard

A licensing agreement with Hewlett-Packard Company permits the systems vendor to embed Citrix ICA thin-client/server technology for Windows and Java into future product lines.

This agreement will enable ICA-based thin-client devices and network computers to access standard Windows-based applications executing on Citrix-based servers, helping businesses reduce costs and increase efficiencies by extending Windows-based applications to more devices. Users will also benefit from the ability to access Windows and Java applications from the same device using Citrix thin-client/server technology.

Wyse

Through a long-standing partnership with Citrix, Wyse Technology and its line of Winterm™ terminals provide the broadest array of thin-client devices on the market. Winterm thin clients enable users to run standard Windows-based applications in conjunction with current and future multi-user application server software from Citrix.

Wyse® solutions enable IT professionals to choose the devices that best fit the user's application needs, including Windows-, Java-, browser- or host-based applications—or all in one. The Wyse approach to thin terminals provides universal access to business-critical applications without any sacrifice in application performance.

FREE!

Big On Thin
CD-ROM
featuring the
WinFrame
Test Drive

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REACHING FARTHER WITH CITRIX

A Citrix thin-client/server solution is the right choice if your company has mixed hardware and operating systems, offices in several locations and mobile employees. It lets computing reach farther, delivering applications and information to any device anywhere, while helping lower your total cost of ownership. Here are five ways successful companies enhanced their operations with Citrix solutions:

Clarian Health, the second-largest private hospital in the country, implemented a Citrix solution to give more than 500 physicians and staff members fast access to patient information over low-bandwidth dial-up connections. Central management and deployment ensures the highest confidentiality and security for sensitive information.

Hewlett-Packard wanted to deploy human resources software to more than 25,000 employees throughout Europe. A Citrix thin-client/server computing solution enables applications and information to be managed centrally, while giving any employee real-time access to critical data for easy updating and tracking.

BM Polyco, a worldwide supplier of utility gloves for the industrial and retail markets, chose a Citrix solution to provide real-time information to suppliers and employees across a mixed environment of operating systems and client hardware. Thin-client/server computing reduced administrative overhead and simplified the deployment of business-critical applications.

The City of Tulsa Park and Recreation Department saved critical taxpayer dollars with a Citrix solution on an installed base of low-end hardware. Thin-client/server computing enabled the department to distribute a recreation automation package across more than 20 sites that enabled park users to reserve a facility or enroll in a class from any location system-wide.

The Bank of Walnut Creek realized a 40-percent savings in up-front capital costs with thin-client/server computing. The Citrix solution eliminated the need to purchase servers and hire network administrators at each branch, while providing access to business-critical applications for PCs and older teller terminals across an inexpensive frame-relay WAN.

Get a FREE *Big On Thin* CD-ROM and Take a WinFrame Test Drive

To get your **FREE** *Big On Thin* CD-ROM featuring the WinFrame Test Drive, simply fill out the information on this card.

Then, you can see the power of WinFrame and how it can simplify the deployment of business-critical applications to remote users. With the WinFrame Test Drive and your Internet access, you'll be able to dial into the Citrix server and experience LAN-like speed as you work with 16- and 32-bit Windows applications from any Windows-based device.

Name ____________________
Company ____________________
Title ____________________
Address ____________________
City, State, ZIP ____________________
Country ____________________
Phone (   ) ____________________
Fax (   ) ____________________
Email ____________________

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1. Which best describes you? (check one)
☐ MIS Manager/End User
☐ Systems Integrator/Reseller
☐ Other ____________________

2. What application(s) are you using and what users are you trying to reach?
☐ Application name(s) ____________________
____
☐ Mobile or telecommuters over dial-up
☐ Branch offices over the WAN
☐ Users of thin-client devices
☐ Internet users
☐ Wireless LAN users
☐ Intranet users

3. What is your project time frame? (check one)
☐ 1–3 months
☐ 4–6 months
☐ More than 6 months

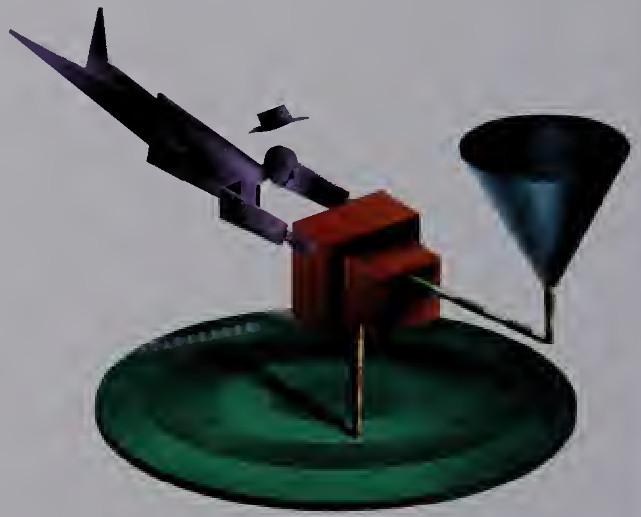
4. How can we be of assistance? (check all that apply)
☐ Please have a Citrix Sales Representative contact me.
☐ Please send me more information on WinFrame.

For a Thin-Client/Server Computing white paper, visit www.citrix.com/drive3

186NW

Get your FREE *Big On Thin* CD-ROM featuring the WinFrame Test Drive today

If the Business Reply Card is gone, you can still take advantage of this great offer. Just call 888-564-7630 and ask for your FREE *Big On Thin* CD-ROM.



THIN-CLIENT/SERVER COMPUTING CITRIX

Citrix Thin-Client/Server Solutions Reduce Cost And Complexity

Finally. Everyone on your network can work together. With greater speed. Performance. Ease. And control. With Citrix solutions you'll have the freedom to go beyond the limits of your network infrastructure, to increase your entire organization's productivity and to lower its TCO. Best of all, you can do it now.

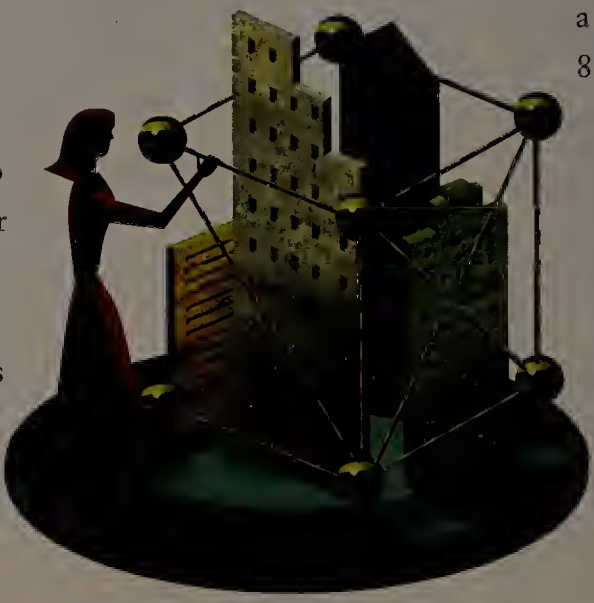
Thin-client/server computing is fast becoming the most reliable way to reduce the complexity and total cost of enterprise computing. And Citrix offers the best in thin-client/server computing.

The Citrix family of solutions delivers powerful application deployment solutions that meet the challenges facing IT professionals and the needs of end users. Here are the access to Windows-based applications for heterogeneous computing environments, enterprise-scale management tools and seamless desktop integration you've been waiting for.

Take a test drive online

You can experience the transparent, seamless, server-based performance that a Citrix solution provides using your Windows-based device. And you can do it today—from your own office—by accessing the Citrix server at our headquarters in Florida via the Internet. Just visit the Citrix website at http://www.citrix.com/drive3

You'll also find white papers and other information about thin-client/server computing, WinFrame and the "pICAsso" Project at our website. If you have more questions, just give us a call. You can reach Citrix at 888-564-7630.



A Citrix solution gives your entire organization access to business-critical applications, across different client devices, operating systems and network connections—even dial-in—without loss in application performance.

CITRIX®

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Fort Lauderdale, FL 33309
888-564-7630
http://www.citrix.com

*Desktop Clients, A Cost of Ownership Study, Spring 1996, Zona Research, Inc.

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Muxes, Routers and WAN switches • Remote Access

Briefs

FlowPoint Corp. *last week introduced two digital subscriber line (DSL) routers designed for branch offices. The routers let multiple remote devices share a single broadband DSL connection to the Internet or a corporate network.* **FlowPoint 144** *supports 144K bit/sec speeds over a regular phone line, and* **FlowPoint 2200** *supports speeds up to 1.1M bit/sec.*

Both boxes can bridge/route IP or IPX and perform proprietary IP address translation, so multiple devices can share one IP address.

FlowPoint 144 *DSL router*

FlowPoint 144 supports four downstream devices and costs $399; FlowPoint 2200 supports four users and costs $599. Both will be available in May.

© FlowPoint: (408) 364-8300

3Com Corp. *last week pulled from its Web site the software upgrade for two models of its* **56K bit/sec laptop modem cards** *because some users said heir modems were wiped out when they tried to install the oftware.*

3Com said interruptions dur-ng software download and nstallation likely purged the modems' memory. 3Com sug-ests performing the download nd installation procedure with the laptop plugged in and with o other applications running.

When 3Com reposts the software, the company will force sers to read an advisory before they can download the software. Com did not say when it would repost the software.

The company said users have downloaded 4,500 copies of the oftware for its Megahertz J1560 and CC1560 56K bit/sec modem cards, and about 20 users ave reported the problem.

Cabletron, Bull enhance management wares

Spectrum 5.0 targets service management; OpenMaster 5 adds Java twist to secure enterprise.

By Jim Duffy
Boston

Users wanting to boost network service levels and improve security can use new products from management giants Cabletron Systems, Inc. and Bull HN Information Systems, Inc.

As expected, Cabletron unveiled Spectrum 5.0, a new release of its enterprise management system targeted specifically at service-level management (*NW*, Feb. 9, page 1).

Bull announced Version 5 of its OpenMaster security software, which features improved reporting, directory access and easier deployment.

Spectrum 5.0 runs on Unix and Windows NT workstations and servers.

With Spectrum 5.0, "they finally got it right," said Daniel Jackson, Spectrum administrator at the University of North Carolina's networks and communications division, in Chapel Hill.

"The autodiscovery works, and it runs fast. And there are a lot of nice new tools for doing things globally across your network, like changing firmware and community strings," Jackson said.

The package includes applications from third-party developers ICS GmbH, in Munich, and Gecko Software, in Great Britain.

ICS unveiled Continuity 3.0, which lets Spectrum users create models of IT resources and measure the performance of IT services delivered by those resources. Gecko rolled out Version 2 of its SAMAN service-level agreement management application.

Cabletron also unveiled its own products for managing service levels among multivendor switches. The offerings include Spectrum ATM Services Manager, VLAN Services Manager and Remote Access Services Manager.

ATM Services Manager is a Java-based tool that lets users schedule and provision bandwidth and traffic priority across Cabletron, Cisco Systems, Inc., FORE Systems, Inc. and Bay Networks, Inc. ATM switches.

VLAN Services Manager enables Spectrum users to define policies for virtual LAN user groups. The policies are designed to automate VLAN administration and usage-based accounting.

Cabletron's Spectrum 5.0 features

- An operator console map that shows application, computer and network service levels
- Third-party applications that combine service-level and business-process management
- Management of WAN dial backup links
- Multivendor switch administration applications
- A Java-based autodiscovery applet

Remote Access Services Manager provides security access control, provisioning and accounting of multivendor remote access devices using the RADIUS authentication service. It provides real-time call monitoring, data capture for trend analysis and help desk support as well as call accounting and billing capabilities.

Lastly, Spectrum 5.0's Java-based Automated Discovery and xModeling System translates IT assets into spreadsheet data for easier and more comprehensive record keeping.

Java Bull

Bull added a Java twist to OpenMaster 5. The software was written in Java and includes the Common Object Request Broker Architecture to enhance scalability, customization and application deployment, Bull said.

To enhance enterprisewide security management, OpenMaster 5 includes support for the Lightweight Directory Access Protocol (LDAP) and supports public-key standards.

LDAP provides access to multivendor network directories to enable network access privileges based on user profiles.

Spectrum 5.0 will ship in May. At press time, Cabletron had not set pricing.

OpenMaster 5 will begin shipping in the third quarter. Pricing starts at $10,000.

© Cabletron: (603) 332-9400; Bull: (978) 294-6000

NetCore's switch packs IP performance punch

By Tim Greene
Wilmington, Mass.

A new switch from start-up NetCore Systems, Inc. will help big IP users guarantee delivery and quality of service (QoS) to mission-critical IP applications.

NetCore recently introduced Everest, a 2.5 terabit/sec capacity box that combines high-speed IP router functions and ATM switching to send end-user traffic with QoS over ATM backbones.

For capacity comparison, Ascend Communications, Inc.'s GRF router tops out at 16G bit/sec, and Cisco Systems, Inc.'s 12000 tops out at 60G bit/sec.

EVEREST TRIES FOR THE PINNACLE

NetCore Systems' Everest switch/router features:

- **Up to 2.5 terabit/sec of capacity**
- **Hardware-based IP to ATM quality-of-service mapping**
- **Early packet forwarding to reduce delay**

Everest works by examining incoming IP packets and, using existing IP parameters such as addresses and port numbers, mapping the traffic onto an explicit ATM virtual connection.

The virtual connection may be chopped into a variety of service levels, from "best effort" to "premium effort," that provide guaranteed bandwidth and QoS delivery. Multiple IP streams can be aggregated onto one ATM pipe, saving WAN costs.

The ATM standards-compliant Everest switch lets administrators configure IP or ATM services on each of its ports. Everest will also be enhanced to support Resource Reservation Protocol and Multi-protocol Label Switching (MPLS) in the future.

This type of device is critical to establishing IP virtual private networks because it could eliminate delays that VPNs can not tolerate over the current public IP Internet, said Tom Nolle, president of CIMI Corp., a technology assessment firm in Voorhees, N.J.

"[QoS] is a requirement of VPNs. You need devices that meld the flexibility of IP with the quality of service of ATM. VPNs are more than just a lighthearted Internet tunnel," Nolle said. He applauded NetCore's promised support of MPLS, which he said would be critical to insuring QoS.

Everest will go into beta this summer and is scheduled to ship in November. Based on price per port, Everest will cost $15,000 for OC-3, $40,000 for OC-12 and $90,000 for OC-48 interfaces.

© NetCore: (978) 694-1555

Get more online:

- An Everest technical overview
- A look at other terabit switch routers

INTERNETWORKING MONITOR

An open letter to Cisco's CEO

The following letter was sent to Cisco CEO John Chambers April 6, 1998. This was shortly after the vendor announced its new token-ring strategy, which is to promote switching to the desktop. Cisco will offer Inter-Switch Link (ISL) as its only planned 100M bit/sec token-ring option. The company then dropped out of the High-Speed Token Ring Alliance.

Dear Mr. Chambers:

Cisco's refusal to offer industry-standard IEEE 802.5 high-speed token-ring (HSTR) uplinks for its switch/router product line is a strategic mistake that threatens your customers and does a disservice to the industry as a whole.

Token ring's more than 20 million nodes provide the infrastructure for some of the most demanding and important business applications around the globe. With more than four million network adapters sold in 1997 alone, token ring is clearly not going away. Cisco's claim that there is no market for HSTR is based on flawed logic.

Until recently, next-generation desktop switches, the proliferation of which would fuel demand for HSTR uplinks, did not exist. When one follows Cisco's and other vendors' new "hub replacement strategy" and replaces, say, just 24 ports of shared token ring with dedicated switch ports, the aggregate demand for that set of ports rockets from 16M bit/sec to 384M bit/sec.

Clearly, if Cisco's newly announced strategy for desktop token-ring switching succeeds, demand for HSTR uplinks will soar. However, if Cisco is correct in asserting that there will be no demand for HSTR uplinks, it can only be because customers have no intention of moving to desktop switching. If this is true, the Cisco desktop switching strategy must be doomed to failure and should be abandoned. Which is it?

Kevin Tolly

Personally, I believe desktop switching will take off. And along with it, so will the demand for high-speed, frame-based uplinks. There is and will be only one multivendor, interoperable industry-standard uplink technology, and that, as you know, is IEEE 802.5 HSTR.

Cisco's insistence on offering only ISL as its HSTR connection can only be taken as an attack on those groups supporting the IEEE standard. And it appears as an attempt by Cisco to manipulate the marketplace and make ISL the de facto standard in place of the de facto IEEE standard.

One week ago, I asked those managing Cisco's token-ring strategy for a commitment to offer — in addition to ISL — IEEE 802.5 industry-standard interfaces on Cisco switch/router products. Cisco product line manager Eric Teagarden's answer was a firm no.

Cisco will not commit to offering IEEE 802.5 HSTR products, he said. This position, he confirmed, was in accordance with the decision made by fellow Cisco executives, Selby Wellman, senior vice president, and Randall Campbell, product manager.

Finally, Cisco customers I've spoken to within the past week are furious at Cisco's position. I respectfully request that on behalf of your customers you intervene and immediately commit Cisco to providing industry-standard IEEE 802.5 HSTR interfaces in your product line.

Tolly is president of The Tolly Group, a strategic consulting and independent testing firm in Manasquan, N.J. He can be reached at (732) 528-3300 or at ktolly@tolly.com or www.tolly.com.

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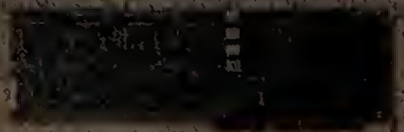

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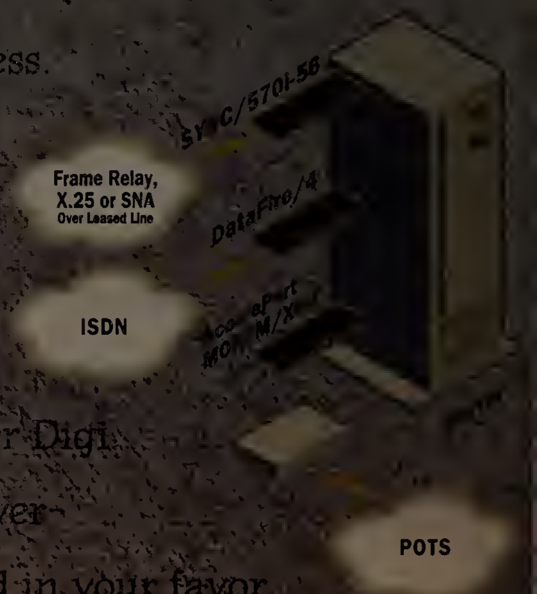

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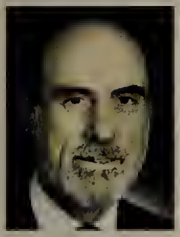
Briefs

■ **Visual Networks, Inc.** *has announced that* **MCI Communications Corp.** *will resell the vendor's Visual UpTime system to all its frame relay customers. Visual Networks makes* **specialized DSUs/CSUs** *that collect traffic data to measure carrier compliance with service-level agreements. MCI currently offers Visual UpTime as part of its managed frame relay service. Visual Networks has similar resale or joint referral arrangements with Sprint Corp., BellSouth Corp. and CompuServe Network Services.*


MCI's *Cerf*

■ **MCI Communications Corp.'s Vinton Cerf** *last week received Columbia University's* **Marconi International Fellowship.** *Cerf, who is senior vice president of MCI and co-inventor of TCP/IP, received the $100,000 award for his contributions to the technology industry.*

■ **Nortel** *has taken a 20% equity stake in* **Avici Systems, Inc.,** *a maker of carrier-class terabit IP switch/routers. Avici, of Chelmsford, Mass., will integrate its terabit switches into Nortel's transmission systems in the hopes of producing* **massively scalable, low-latency IP network infrastructures** *capable of carrying multimedia traffic.*

■ **Hypercom Corp.** *last week said it will release an IP telephony software upgrade for its Integrated Enterprise Network (IEN) 6000 voice traffic gateway. The software will provide users with* **toll-quality voice support** *between Hypercom's boxes. The software is based on new Digital Signal Processing technology and toll-quality speech compression algorithms. The software is free to IEN 6000 owners. The upgrade will be available in June.*
© Hypercom: (800) 577-5501

Bell Atlantic gains ground in long-distance battle

But RBOC draws opposition with specialized application for long-distance data authority.

By David Rohde
Washington, D.C.

Bell Atlantic Corp. has taken one step forward and one step back in its effort to get into the long-distance business.

The regional Bell operating company received some public support from top New York state regulatory officials for its high-profile move to carry long-distance traffic originating in the state. But the company drew the opposition of three of the top four long-distance carriers for a separate application to enter the national long-distance broadband business.

In the New York case, Bell Atlantic won a "pre-filing statement" from the New York Public Service Commission (PSC) that outlines steps Bell Atlantic can take to gain state approval for entry into the long-distance market. Bell Atlantic President Ivan Seidenberg had previously complained that state and federal officials were not making clear what the RBOC had to do to gain long-distance approval.

The pre-filing statement would require Bell Atlantic to make bundles of network elements available to competitors without adding an extra charge to pull the elements together.

This approach, known as the "unbundled network element platform (UNE-P)" has been resisted by other RBOCs. BellSouth Corp., in particular, has insisted that potential competitors buy individual UNE-Ps, such as switch ports and local loops, in piecemeal fashion.

Outgoing New York PSC Chairman John O'Mara and the U.S. Department of Justice's top antitrust official, Assistant Attorney General Joel Klein, said they would support Bell Atlantic's long-distance application if it met all of the points in the pre-filing statement.

Bell Atlantic hit rough waters with a specialized data application to the Federal Communications Commission when three of the four big long-distance carriers filed emphatic statements of opposition.

AT&T, MCI Communications Corp. and WorldCom, Inc. told the FCC they oppose Bell Atlantic's attempt to get free geographic reign to offer packet data services even before Bell Atlantic gains regular long-distance approval. Bell Atlantic filed the specialized data application under the little-known Section 706 of the Telecommunications Act of 1996.

Section 706 directs the FCC to promote advanced data networks by removing regulations that hinder their deployment. Bell Atlantic has asked the FCC to use Section 706 to drop restrictions against RBOCs carrying data traffic beyond their usual regional calling areas. Ameritech Corp. and US WEST, Inc. have petitioned the FCC as well. All three said such a move would help them build new regional broadband networks, potentially including Internet backbones (*NW*, April 6, page 25).

AT&T Vice President Mark Rosenblum complained he didn't believe the RBOCs would restrict their new authority to data traffic, claiming they would also move voice traffic to the new network. In written comments, MCI labeled the Section 706 petitions as part of "a plan by several Bell monopolies to circumvent the telecom act." MCI merger partner WorldCom also used strong language, labeling the Section 706 petition a "Trojan horse" for complete long-distance entry.

Even so, the FCC this year must act in some fashion to implement Section 706. The telecom act requires the FCC to invoke Section 706 to drop some regulatory barriers on data-network deployment — or show that it has a plan to do so — within 30 months of the act's passage. The deadline is this August. ■

PART OF MCI'S ATTACK AD

> ***"... freedom of choice in local telephone service has been stifled. The big local monopolies continue to maintain a 99% market share. ... Real competition simply does not exist. ..."***

MCI is running attack ads against RBOCs in Washington, D.C. and Albany, N.Y., where federal and state regulators will decide on whether to accept Bell Atlantic's petition to enter the long-distance market.

GTE builds new 'Net backbone

By Denise Pappalardo
Cambridge, Mass.

GTE Internetworking is beefing up its Internet backbone by building new facilities that will offer users significantly more bandwidth and enhanced quality-of-service (QoS) features.

GTE Internetworking, GTE Corp.'s Internet service provider subsidiary, earlier this month announced it will deploy Ascend Communications, Inc. ATM and frame relay switches throughout the ISPs new Internet backbone network, called the Global Network Infrastructure (GNI).

Initially, the ISP will roll out 30 Ascend B-STDX 9000, CBX 500 and GX 550 carrier-grade frame relay, multiservice and ATM switches, respectively. The devices will be used throughout GTE Internetworking's sites in nearly 30 cities.

GTE Internetworking also is rolling out Ascend's IP Navigator software, which can support IP virtual private networks (VPN) across the switches with guaranteed QoS. IP Navigator will let network administrators map IP quality requests over frame relay and ATM connections.

IP Navigator can be supplemented by Navis, Ascend's network management software that allows drag-and-drop provisioning of VPNs as well as enhanced network management and accounting. Navis also can enable a service that lets customers get a glimpse of how their circuits are performing.

The ISP plans to use Ascend's QoS software tools to offer users better service-level agreements and guarantees in the future, said Ken Baldwin, assistant vice president of market management at GTE Internetworking.

It's imperative that GTE Internetworking and other ISPs and telcos build higher bandwidth networks with the latest switching technology in order to stay competitive, said Eric Paulak, research director at Gartner Group, Inc., a Stamford, Conn.-based consulting firm.

GTE has been throwing resources behind building a second Internet backbone network since the ISP acquired BBN Corp. almost one year ago.

While GTE is not eliminating the original BBN network, which maxes out at OC-3 speeds, the ISP will instead interconnect the new OC-192 GNI when that network goes online.

The Ascend switches are the latest addition to GTE Internetworking's GNI. The ISP has already purchased Synchronous Optical Network (SONET) gear from Nortel and 15,000 miles of OC-192 route fiber miles from Qwest Communications Corp.

The GNI is expected to be completed by the end of 1999. ■

Get more online:

- Details about GTE's other expansion plans
- Overviews of the gear GTE will be using

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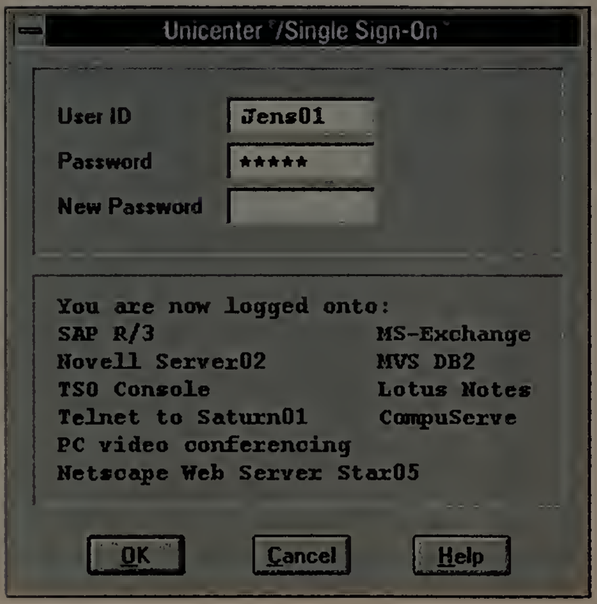

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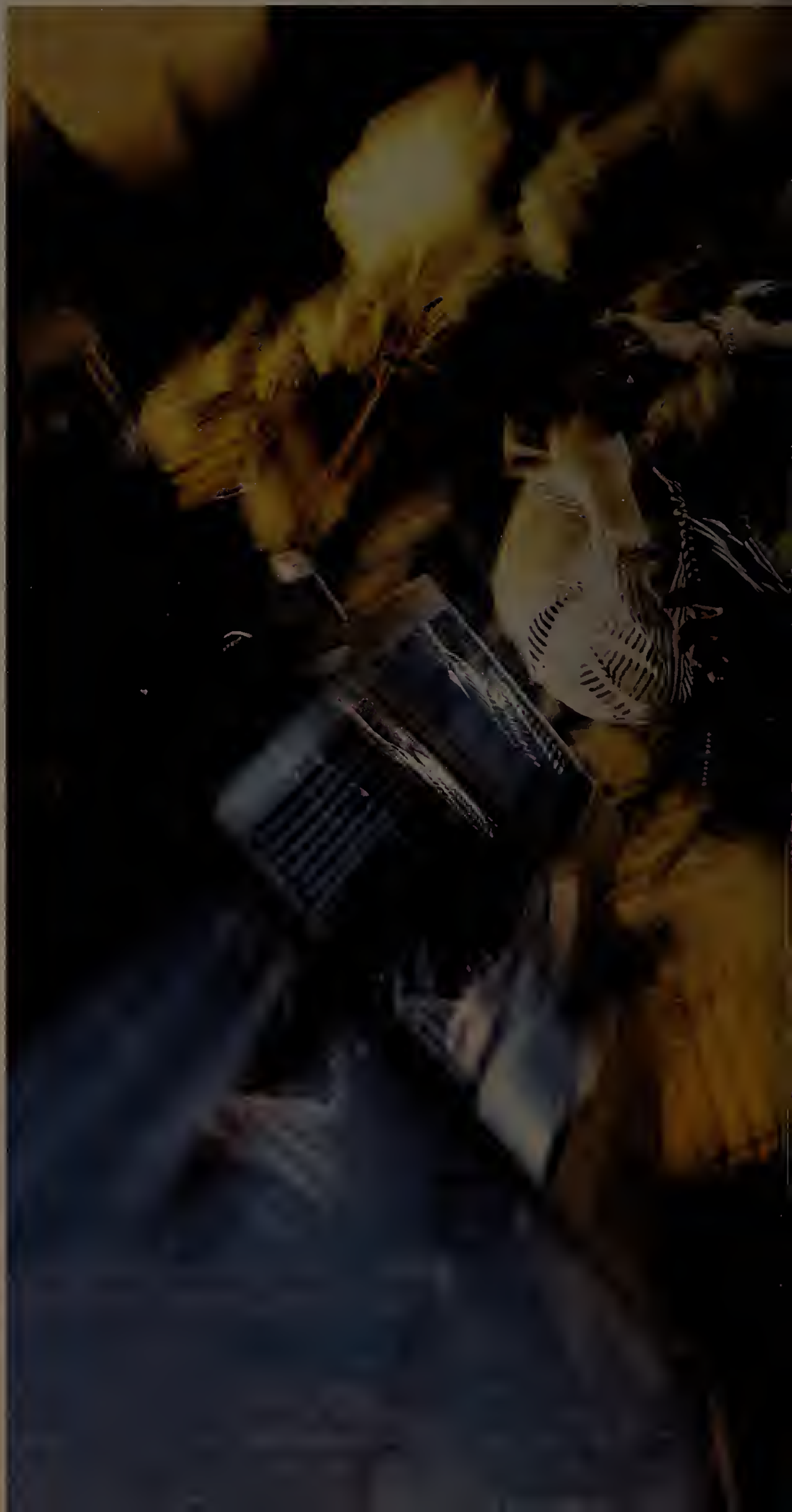

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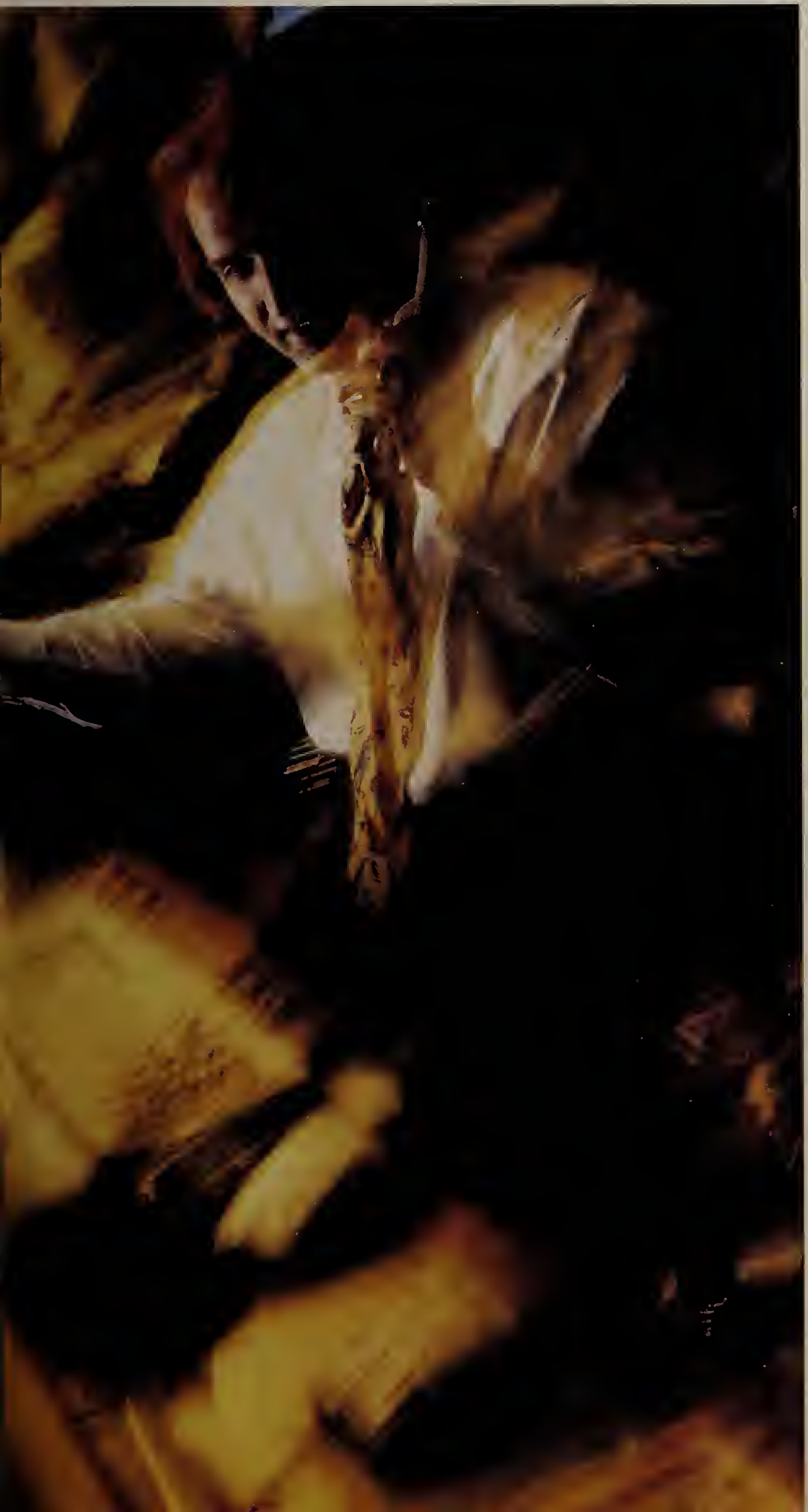

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EYE ON THE CARRIERS

IP telephony: Distracting the enemy

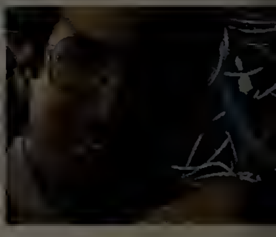
Managing packet data networks is a wide-ranging task. But when you pick up your phone to solve a problem, I bet you still use the good old telephone network. What's more, I wouldn't be surprised if your company's long-distance rates are below those of supposedly inexpensive IP telephony services.

So what's the use of Internet telephony? Here's what: It's a great political distraction. The discussion raging again over regulating Internet telephony may actually buy you time to make the numbers work for managed intranet and virtual private network services.

That's because the Federal Communications Commission, under pressure from some senators to regulate the Internet, has basically called their bluff.

Congressional critics, led by Sen. Ted Stevens (R-Alaska), once again last fall asked the FCC to consider forcing Internet service providers to pay universal service charges and other fees of telecom carrier regulation. The Stevens bloc's prime piece of evidence: You can make phone calls over the Internet! Surely that means the 'Net is no longer the "enhanced service" regulators have always taken to mean "a non-telecom service that we can't regulate or assess fees on."

Fine, the FCC said in the report to Congress that Stevens demanded. If an ordinary phone call passes through an IP gateway on the way to its destination, maybe the IP carrier ought to pony up some dough to support universal service. Otherwise, the FCC said, it's not worth the trouble to embroil the 'Net in the wicked world of telecom regulation and politics.


David Rohde

There are two ways to look at this. Some Internet providers are unhappy that the FCC gave in on the telephony issue. Once the door's open, they reason, members of Congress could tap additional Internet traffic for the funding they need to subsidize rural phone lines, telemedicine and other projects. Couldn't they reason that e-mail is not an enhanced service? What I send is what you get, just like a phone call.

But other Internet provider officials are satisfied with the FCC's report. One told me that Internet telephony is Stevens' "poster child," not his real target. Stevens wanted access fees on all Internet traffic to get a big new source of funding for embattled residential phone subsidies, and he failed.

Besides, the FCC didn't actually propose an Internet telephony tax. The FCC merely indicated it would entertain petitions to regulate phone-to-phone communications that utilize IP gateways. The long, drawn-out rulemakings that would follow would probably chew up a year or two while Internet data traffic continued to burgeon, free of regulation.

What do you think? Has Congress been tricked into a silly crusade on a marginal service, while the real work of the Internet remains free of costly regulation? Or is this a bad precedent that could affect the legitimate growth of IP voice and fax as well as the Internet as a whole?

Remember: Like the issue of online smut, this isn't going away. Few people protested last year when the FCC boosted universal service by $2.25 billion per year to pay for classroom Internet access. So if you're opposed to any new universal service charges, perhaps the next question should be: Is the concept of universal service itself out of control?

Rohde is Network World*'s senior editor of Carriers & ISPs. He can be reached at david_rohde@nww.com.*

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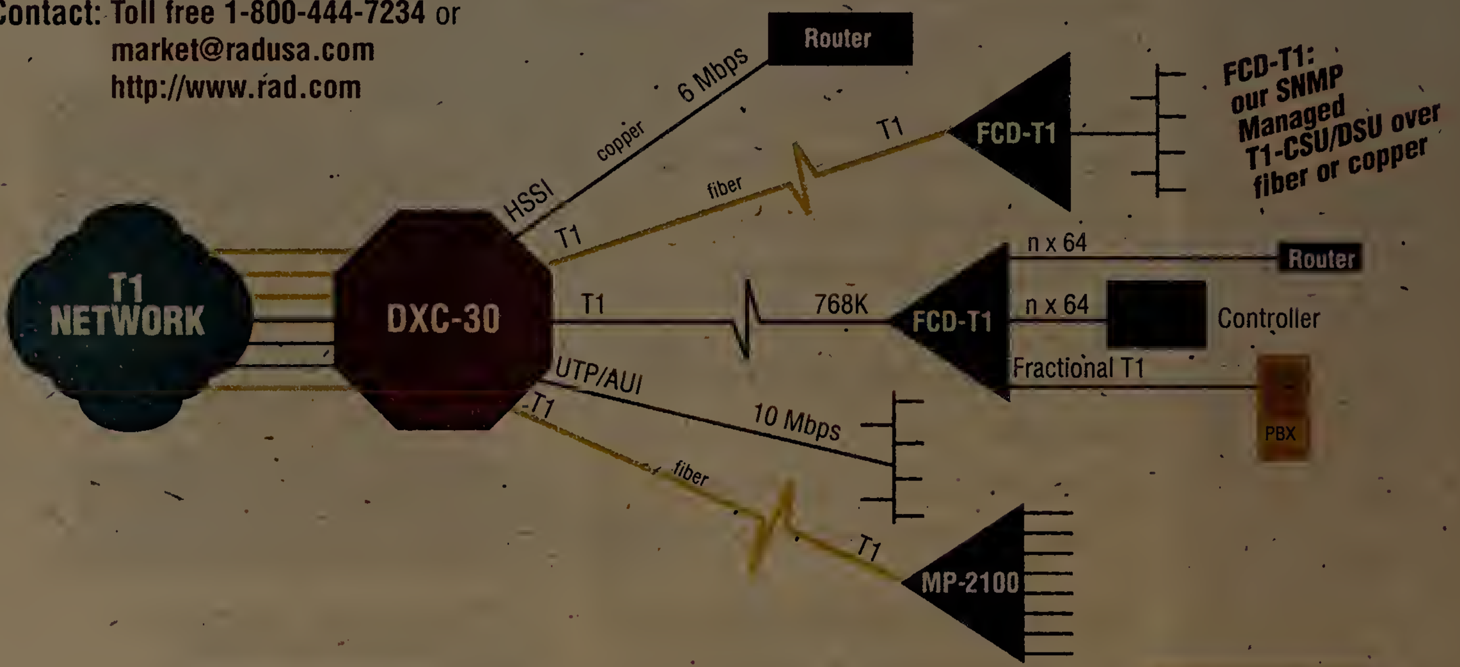

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Briefs

Netscape Communications Corp., Sun Microsystems, Inc. *and* **Hewlett-Packard Co.** *last week announced their support for a proposed Internet-based standard that will enable disparate workflow software packages to interoperate. More than 20 vendors and organizations are supporting the development of the* **Simple Workflow Access Protocol.** *Workflow products would use the proposed protocol to manage, monitor, initiate and control the execution of workflow processes.*

Canadian *Industry Minister John Manley*

Canada *will host an* **electronic commerce conference** *in October and will invite the 28 industrialized countries belonging to the Organization for Economic Cooperation and Development. Participants will discuss the taxation of goods sold or content delivered over the World Wide Web, data privacy issues and the use of digital signatures.* **Canadian Industry Minister John Manley** *last week said high-tech companies, such as IBM, are also being invited. For more information, call (613) 990-4292.*

Elron Software, Inc., *of Cambridge, Mass., has begun shipping a new edition of its* **firewall** *that includes support for the Point-to-Point Tunneling Protocol, CU-See-Me interactive video and NetBIOS. The firewall, which sells for $4,995, can handle up to 1,000 simultaneous users.*

Zanza Software, Inc. *has announced a new version of its interactive* **Web reporting** *product. Zanza Web Reports 2.0 includes a way to set up scheduled database queries to extract data that can be stored in a local file cache.*

© Zanza: (650) 780-0600

Three-year-old Java still misunderstood

By Chris Nerney

Java guru Ted Young was giving a talk in February to network professionals working for Federal Department of Energy subcontractors when one attendee asked if the programming language could work on his enterprise.

"This guy said his company had two of everything on its network," said Young, who is president of Advanced Web Technologies Corp., a Java training and outsourcing firm in New York. "I explained that Java was designed to run on multiple platforms. After my speech he came up to me and said, 'I didn't know Java could do that.' "

It is surprising that Java is still so misunderstood. After all, it has been three years since Sun Microsystems, Inc. introduced Java as the programming language and platform that would transform how networks run. Since then, Sun and its partners in the Java alliance — notably IBM and Oracle Corp. — have gone to great lengths to educate the IT world about Java's virtues, sponsoring conferences and setting up Web sites where developers can get a big-picture view of Java or trade coding tips.

The effort has paid off, resulting in an intense level of interest in Java and a growth in the number of Java programmers, now estimated by Sun to be more than 800,000.

But Young and a number of other independent systems integrators interviewed by *Network World* said that despite the concerted effort to enlighten the market, many IT professionals still lack a fundamental understanding of Java. "I'm always surprised by how basic many of the questions are," Young said.

"It's amazing how little people know about it," said Ron Repking, an integration consultant and owner of ISA Services, Inc., of Chicago. "I frequently encounter two big misconceptions about Java. One is that you can't build real large-scale systems with it. People think of it more as something they can do cool things with on the Web. They don't realize the richness of all the APIs.

"The second is that there's no way to run Java unless you're in a Web-type environment, which is completely untrue," Repking said, citing the development of server-side applets, or "servlets," as well as server-based applications.

Many misconceptions about Java "come from people having old information," said Vlad Kroutik of Cambridge Technology Partners, Inc. (CTP), in Cambridge, Mass.

"Many IT professionals aren't keeping up with how fast Java is unfolding," Kroutik said. For example, people often argue that Microsoft Corp.'s VisualBasic Integrated Development Environment (IDE), a tool for building applications using the VisualBasic scripting language, is "far superior to Java IDEs because it's been on the market for five years," he said.

"That may have been true a year ago, but today there are four or five industry standard-class IDEs on the market for Java," Kroutik said. ■

Java myths

Independent systems integrators helping to install Java in corporate enterprises said there are several misconceptions regarding Java among network managers and other IT professionals, including:

- Java is not cross-platform.
- Java applications cannot run on Windows.
- Java is not an enterprise language.
- A browser is required to run Java.
- Java cannot serve as a platform.

Get more online:

- **More misconceptions and answers to questions about Java**
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InfoBeat boosts e-mail volume

'Service bureau' processes large e-mail quantities.

By Andy Eddy
Denver

Many in the network industry have turned against "push," calling the concept dead. But a new wave of proponents claims push is alive and well — as long as it is done through e-mail.

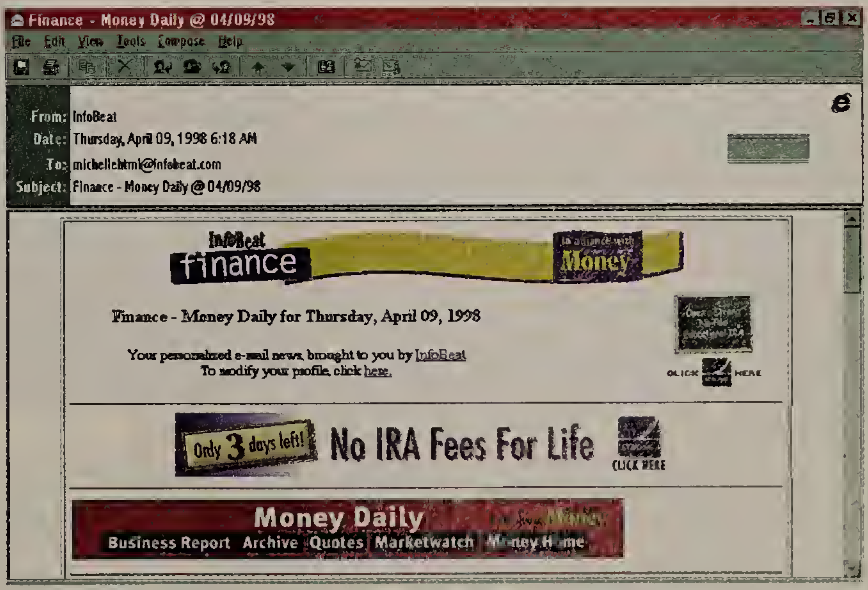
One such advocate is InfoBeat, Inc., which claims to be the largest publisher of e-mail.

The company this week launched a new service called InfoBeat Express. The "service bureau" can do bulk e-mailing for companies that don't have the time, experience or inclination to do it themselves.

Rest assured InfoBeat isn't following in the footsteps of Sanford Wallace, the legendary spam king, in cranking out myriad pitches for multilevel marketing pyramids, get-rich-quick schemes and unsolicited offerings. Instead, InfoBeat Express targets subscribers of solicited content. It has already worked with such companies as American Express Co., Charles Schwab & Co. and Tribune Media Services, company officials said.

While a lot of tools are available to send out large quantities of e-mail, InfoBeat said it has improved the overall procedure. The company maintains that it can "broadcast" up to six million identical e-mail messages per hour or 500,000 personalized messages per hour. The process can be used in an Internet setting much like a mailing list, in an intranet to a number of employees, or in an extranet to a roster of clients or customers.

InfoBeat's founder and Chairman John Funk said the process not only can dole out large numbers of e-mails, but it also assesses bounced messages, errors and vacation autoresponses to determine the viability of an e-mail address, keeping the customer database fresh.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InfoBeat *is working with companies to process and send out large numbers of HTML-coded mail messages offering targeted content, such as this sample of financial news in conjunction with Time Warner's Money Online.*

Elements of the e-mail message can be tracked by InfoBeat's servers, revealing whether a subscriber has read a message, which further aids in purging the subscriber list of obsolete addresses. ■

'NET INSIDER

Writing for the record

As has been demonstrated yet again in the case of the tobacco companies, what you write down can come back to haunt you.

Hundreds of thousands of documents have been surrendered by the tobacco companies and are being scrutinized by these companies' challengers. This is the sort of case where writing down the wrong thing may wind up costing a few billion dollars.

In the tobacco case, the documents were meant to be internal communications, but the same set of problems can easily come about if an employee is careless in a letter to a customer.

Many firms now require that all paper mail sent to customers be preapproved so the sending company can be sure there are no misrepresentations of facts or any misleading wording. Some companies have even created a catalog of preapproved letters to be used when communicating with customers.

And now in addition to paper mail, companies are faced with the implications of e-mail correspondence.

At first glance it would seem as if these companies could treat e-mail just like any other correspondence and use the same processes that were set up for paper-based mail. But the dynamics of e-mail exchanges are much different than those of paper-based exchanges.

People have a tendency to respond quickly to questions posed via e-mail. Requiring e-mail users to forward their replies through a person acting as a veracity checker is at best clumsy and time-consuming. *The New York Times* reports that at least one firm is looking into software that would scan all outgoing mail for legally dangerous phrases, such as "my mother," as in "this security is so safe that my mother has invested in it."

Scott Bradnor

The ease with which e-mail can be forged presents other problems. In the long run, this can be dealt with by requiring that all employees who send e-mail to customers use an e-mail package that automatically appends a digital signature to every message. But it will be a while before secure e-mail packages are widely deployed.

In the meantime, organizations may have to resort to saving a copy of all outbound e-mail to prove that a particular message was modified after transmission or that a particular message was never sent. Then again, proving that a message was never sent might be hard to do in court, so saving copies may not be sufficient.

There are also very real privacy issues with any procedure that involves storing all correspondence, including letters between lovers. In addition, keeping copies of e-mail does not address employees sending messages from non-company accounts, such as private accounts with an Internet service provider or America Online.

Training employees to be very careful in their e-mail exchanges and to assume they are writing for posterity — and a future claimant's lawyers — is just one of the many challenges that accompany this digital age.

Disclaimer: Let it be known that these words are not the official or unofficial pronouncements of Harvard University. (Is that clear enough?)

Bradner is a consultant with Harvard University's University Information Systems. He can be reached at sob@harvard.edu.

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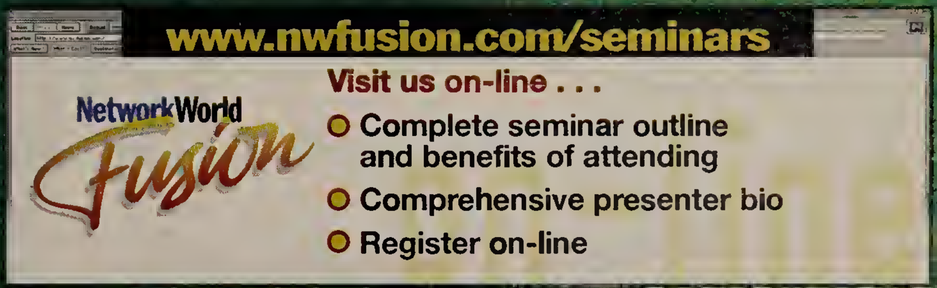

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NETWORK WORLD
200
Ranking the Industry's Biggest and Baddest Competitors
TWO HUNDRED

Big and Bigger

Year-to-year growth among the Network World 200 slowed in 1997, but don't tell that to the runaway winners. The perennial powerhouses surged ahead, chalking up 20%-plus revenue gains. Together the NW200 — the largest 200 companies in the network game — weighed in with a whopping $669 billion in sales. **Page 40.**

ALSO INSIDE:

Up and Comers
Making the Network World 200 isn't easy, and it gets harder every year because the revenue bar keeps creeping up. We tracked down five companies just over the NW200 horizon to give you an idea of who might pop onto the list in '98.
Page 57.

The Stalwarts
You know the names: Cabletron, 3Com, AT&T, Netscape, Cisco. They are established players with boatloads of customers and more than a bit of history. But competition is making things tough on everyone. We identify the challenges facing these stalwarts and the strategies they hope will keep them on top.
Page 63.

What's in a Name?
Few company names rival the frivolity of the now defunct NBI, which stood for Nothing But Initials, but there are many funny and interesting stories behind those shiny corporate monikers.
Page 77.

Best Practices
Skimming the cream off the top of the NW200 will leave you with a ladleful of huge companies. But size alone does not equate with greatness. We tracked down four industry leaders who are excelling. Interviews with Pfeiffer, Ebbers, McGinn and House.
Page 79.

Who's Zooming Who?
Need a score card to keep track of the players given the merger and acquisition feeding frenzy? We've put one together and analyzed the biggest deals.
Page 85.

Fusion
There's plenty more online, including financial and stock information for profiled companies, biographies of featured individuals and a spreadsheet version of our NW200 list for you to play with.
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Year-to-year growth among the
but don't tell that to the runawa

Big & bigge

By John Dix

Think quick, who's bigger: Coca-Cola or Compaq? Anheuser-Busch or Microsoft? Bethlehem Steel or Cisco?

If you picked the household names, guess again.

Microsoft vaulted over the beer baron last year, with revenue growing 31% to $11.4 billion vs. Busch's $11 billion; Compaq rocketed past Coke with $24.6 billion vs. $18.9 billion; and Cisco leapfrogged the steel giant with $6.4 billion vs. $4.6 billion.

OK. It's a trick question. The mainstream companies over the years have spent millions on name recognition, so the tendency is to associate them with bulk. But the fact that these and other network players are outpacing national corporate icons says something about the mainstreaming of technology and the vibrancy of the industry. Heck, based on early 1998 results, Microsoft has even passed McDonald's.

Not all of the network vendors that made the Network World 200 this year fared as well as these perennial powerhouses. In fact, as a group the NW200 only mustered cumulative revenue growth of 9.8% last year, inching up from $609 billion to $669 billion. That compares with 12.5% growth for the NW200 as a group between 1995 and 1996.

But there was a sizable contingent of big winners. Some 85 companies on the NW200 grew 20% or more in 1997. Forty-six companies in that group grew revenue 40% or more, and 12 companies grew 100% or more.

Interestingly, while profits for the group were up 8.5%, nearly a third of the NW200 companies reported losses last year. Many of these companies are indeed in dire straits (Novell and Apple come to mind), but for others — particularly upstart telecommunications concerns — being in the red is simply a result of feverish investment.

Witness ICG Communications, No. 99 on the NW200. Revenue at this little competitive local exchange carrier was up 43% last year to $273 million, but the company posted a loss of $327 million, much of it related to acquisition expenses.

Does that worry investors? It doesn't seem to. The company has a market capitalization (the value of its outstanding stock) of $1.4 billion.

In fact, market capitalization is a new field we added to the NW200 this year as a quick and dirty way to summarize public confidence in a company's position and financial stability.

HOT GROWTH COMPANIES

Fastest growing companies '96-'97

1997 Revenue Rank	Company	Worldwide revenue * 1996	1997	'96-'97 %Δ
164	American Communications	9	59	556%
174	Excite	15	50	239%
154	Yahoo	20	67	238%
133	Osicom Technologies	34	116	236%
178	Concentric Network	16	45	190%
172	MindSpring Enterprises	18	53	190%
130	Citrix Systems	45	124	178%
163	Open Market	23	61	172%
143	CheckPoint Software	32	83	159%
43	Qualcomm	814	2,096	158%
194	Broadvision	11	27	145%
104	Intermedia Communications	103	248	140%
83	Teleport Communications Group	211	494	134%
188	RealNetworks	14	33	134%
196	First Virtual	13	26	100%

Fastest growing companies '92-'97

1997 Revenue Rank	Company	Worldwide revenue * 1992	1997	'92-'97 CAGR**
89	FORE	1	395	228%
130	Citrix Systems	2	124	128%
128	Remedy	3	129	119%
120	MRV Communications	5	165	106%
99	ICG Communications	8	273	105%
168	Edify	2	57	104%
104	Intermedia Communications	7	248	104%
98	Pairgain Technologies	10	282	97%
131	PSINet	6	122	80%
27	Cisco	382	6,400	76%
161	Transaction Network	4	63	74%
126	Security Dynamics	13	136	61%
191	Voicetek	3	29	54%
22	Dell Computer	890	7,759	54%
37	3Com	408	3,147	50%
38	EMC	386	2,940	50%

* In millions ** Compound annual growth rate

Network World 200 slows,
winners.

n

Broadly speaking, the greater the difference between a company's revenue and its market cap, the brighter the future looks.

Nowhere is this confidence more rampant than in the case of Microsoft. The world seems to think the sky is the limit for the Redmond rocket. As of this writing, Microsoft's market capitalization is $199 billion, some 18 times revenue.

Compare that with, say, General Motors. With $177 billion in sales last year, GM is the largest company in the country. But its market cap is a mere $46 billion.

While the discrepancy can be explained away in this manner and that, suffice it to say that puny Microsoft, whose sales were 94% lower than GM's, posted net income in 1997 of $3.5 billion, more than half of the $6.7 billion in profits GM generated.

Even when you do more of an apples-to-apples comparison, one high-tech company to another, it is clear the world likes Microsoft's prospects. IBM, the No. 1 company on the NW200, posted revenue of $78 billion last year, but its market cap is only $99 billion. And $5.6 billion Oracle, the second-largest pure software play, only commands a $29 billion cap.

Besides the capitalization data, new items added to the NW200 this year include stock symbols and Web addresses, all in the name of making it easier to further research the companies listed.

But the most significant change is the timing of delivery. Whereas in years past we published the NW200 in January, from now on we will publish it in April so we can base the list on actual year-end data. Publishing in January required finalizing the research in November and using projected year-end numbers, some of which ultimately did not match reality.

Is the NW200 a perfect representation of everything networking? Not in the true sense of the word because 1) we include only U.S.-based companies, 2) we exclude companies whose primary customers are other vendors or residential consumers, and 3) we include some computer companies because of their influence in networking and exclude those with little vested interest.

Perfect? No, but the only network industry list of its kind.

WHAT THE NUMBERS TELL

While many industry voices — including *Network World* — were bemoaning the fact that telecom reform did little to benefit customers last year, behind-the-scenes companies continued the scrambling that began with the ratification of the telecom reform act in 1996.

Let's see, the Pacific Telesis Group and SBC Communications merger was consummated, as was the NYNEX/Bell Atlantic deal; BT bailed on MCI after WorldCom came riding into town on a barrel full of stock; AT&T drop-kicked its CEO and finally brought in some fresh blood; various regional Bell operating company attempts to break into long distance were quashed; long-haul newcomer Qwest started to make established players sit up and take notice; and digital subscriber line (DSL) technology had the industry all a titter.

Ivan Seidenberg, the former NYNEX chairman who is now Bell Atlantic's vice chairman, president and chief operating officer, proclaimed at the ComNet conference in January that the telecom reform act is working: "We've seen $60 to $70 billion worth of market activity driven by the act."

Much of that probably can be chalked up to merger play among entrenched carriers, but there is significant activity among smaller players that are building fast.

Take Intermedia (No. 104). This Southeast regional carrier that specializes in frame relay-based Internet access services posted revenue of $248 million last year, up 140% from the year before. And it is still going great gangbusters.

Then there are more ambitious companies such as Qwest. Although it was excluded from the 1997 NW200 list because its primary

EMPLOYEE BOOM

Companies adding employees fastest '96 -'97

1997 Revenue Rank	Company	Employees '96-'97 %Δ
174	Excite	208%
143	CheckPoint Software	150%
104	Intermedia Communications	135%
130	Citrix Systems	106%
176	D-Link Systems	104%
65	Century Telephone	71%
99	ICG Communications	71%
126	Security Dynamics	67%
166	Applied Voice Technology	63%
105	Centron DPL	58%
128	Remedy	56%
172	MindSpring Enterprises	56%
131	PSINet	56%
194	Broadvision	52%
52	SAP America	52%

MANAGING PROFITS

Most profitable companies in 1997

1997 Revenue Rank	Company	Profits as % of '97 revenue
143	CheckPoint Software	48%
60	Hughes Network Systems	41%
130	Citrix Systems	33%
18	Microsoft	30%
80	BMC Software	29%
65	Century Telephone	28%
137	Hummingbird	28%
7	Intel	28%
182	Memotec Communications	25%
146	Davox	24%
34	Computer Associates	24%
27	Cisco	22%
56	Tellabs	22%
128	Remedy	21%
63	Adobe Systems	20%

Largest increase in profits in '96-'97

1997 Revenue Rank	Company	'96-'97%Δ
65	Century Telephone	478%
43	Qualcomm	337%
89	FORE	328%
20	Seagate Technology	209%
135	Procom Technology	200%
60	Hughes Network Systems	177%
143	CheckPoint Software	164%
56	Tellabs	124%
130	Citrix Systems	121%
37	3Com	110%
146	Davox	102%
67	American Management Systems	101%
51	Data General	99%
22	Dell Computer	90%
31	Computer Sciences	76%

Largest increase in profits in '92-'97

1997 Revenue Rank	Company	'92-'97 CAGR*
89	FORE	115%
38	EMC	79%
27	Cisco	77%
56	Tellabs	73%
135	Procom Technology	70%
30	Oracle	68%
126	Security Dynamics	68%
130	Citrix Systems	62%
20	Seagate Technology	60%
22	Dell Computer	59%
9	Compaq	54%
96	Comverse Technology	49%
62	Adaptec	49%
73	Mitel	46%
7	Intel	45%

*Compound annual growth rate

business is selling fiber capacity to other carriers, Qwest recently acquired LCI International for $4.4 billion and is making a run at the corporate user business.

Combining LCI's network assets and customer base with Qwest's high-capacity fiber backbone — which will span 16,000 miles and reach 125 cities when completed this year — will be a potent mix. Look for Qwest to be something like the 40th largest company as measured by the NW200 next year.

Last year also saw the emergence of carriers — all too small to show up on the NW200 radar — that are using DSL and discounted RBOC lines to offer multimegabit services. A handful of these may crop up on the list for 1998.

DSL is expected to succeed where ISDN failed because, for one, the local carriers have now pushed their fiber loops closer to users and the industry is getting a boost from Compaq, Microsoft and Intel, which have agreed to deliver DSL-compliant products.

"I have a lot more faith in what Compaq and Intel can do with DSL than [in] what Lucent and Nortel could do with ISDN," Bell Atlantic's Seidenberg says. But we aren't there yet. "DSL is still too expensive and not scalable at the cost points we need," he adds.

The other telecom technology news of note didn't really break until January, when newcomer Level 3 started talking about IP-everything backbones. A "start-up" with $3 billion in capital, Level 3 is headed by James Crowe, former CEO of MFS. The idea is to build a nationwide $9 billion IP network, initially offer data and fax services, and ultimately add IP voice to the mix.

Whether Crowe is successful or not, the bold vision has sent all the big carriers back to their boardrooms to study the implications. Of that crowd, the newly combined MCI WorldCom would be best positioned to ride the IP wave, should it develop, given the strength of its various Internet resources. In fact, as of this writing, those very resources have lawmakers pondering whether the merger would give too much control over the Internet to a single source.

LAN HO

Mergers also were the talk of the town in local network circles last year. The most monumental was 3Com's $6.5 billion acquisition of modem maker U.S. Robotics, which was seen by many as risky given the size of the deal and the fact that the companies are geographically distant.

3Com CEO Eric Benhamou downplays the concerns, saying he learned what to avoid by studying the failures of other mergers. But the numbers have yet to bear him out.

Recombining 3Com's and U.S. Robotics' fiscal 1997 results leaves the merged company with $5.6 billion in revenue and $500 million in profits last year (the deal was finalized after 3Com closed the books on 1997 last May, so the numbers on the NW200 chart are different).

In the first nine months of fiscal 1998 sales were $4 billion, down 4% compared with the recombined numbers for the same period last year, and the company reported a net loss of $33 million because of charges associated with the U.S. Robotics merger. Excluding those charges, 3Com would have posted net income of $180 million for the first nine months of 1998. That compares to $274 million in profits in the same period last year.

ACSI rockets to the top

Little carrier is fastest growing NW200 company

Don't tell American Communications Services (ACSI) that the Telecommunications Act of 1996 isn't working.

Revenues at ACSI, the fastest growing company on the Network World 200, jumped up 556% last year, from $9 million to $59 million.

Formed in 1993 as a competitive access provider serving Southern cities, as late as year-end 1996 all revenue was derived from dedicated and special access services.

But after the act passed ACSI decided to jump in with both feet. And jump it has. Whereas at the end of 1996 the company had 29 Newbridge ATM switches and had sold 360 access lines, by year-end 1997 it had 39 ATM switches and 16 Lucent 5ESS central office switches, and had sold 43,581 customer access lines.

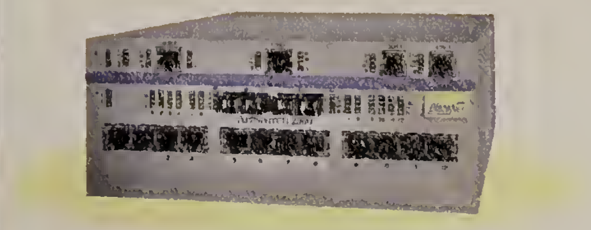
Services offered now include local and long-distance voice, calling card, audioconferencing and a fairly complete list of data offerings, including frame relay and ATM. The primary missing component is a full-fledged Internet offering, but the company bought an Internet service provider in Florida earlier this year and will extend the service throughout its territory, says CEO and President Jack Reich.

That territory includes 32 Tier 1 and Tier 2 cities – places such as Baltimore, Dallas and Fort Worth – in 19 states. The cities are wired with some 1,000 network route miles (98,000 fiber miles) and are, in turn, strung together with a coast-to-coast leased fiber backbone.

Reich says the company – which last week was renamed e.spire – competes on price, undercutting traditional local service by 10%; on customer service; and on integrated billing.

The plan this year is to open up shop in Miami and Atlanta and enter two other cities that Reich wouldn't identify. "We'll go from 16 5ESS switches to 25 by the end of the year," he says.

The act is working just fine, thank you very much.



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But it's even more complicated than that. That $274 million profit in 1997 reflected charges from earlier mergers. Excluding those charges, 3Com would have posted $501 million in net income in the first nine months of last year.

When you exclude all charges in 1997 and 1998 to try to get an apples-to-apples comparison, you see income at 3Com for the first nine months of this year is down 64% compared with last year.

Benhamou still has some fine-tuning to do.

Profit problems aside, there's that little matter of having to keep up with the Joneses — in this case, archnemesis Cisco. The router king's revenue was up 56% last year to $6.4 billion. Had 3Com not bought U.S. Robotics, it may have risked becoming an also-ran.

That risk is staring Cabletron and Bay Networks in the face. Although revenue at Cabletron was up a respectable 28% last year to $1.4 billion, the company is steadily losing revenue ground to Cisco and 3Com, ground that will be increasingly hard to recover as the larger companies get stronger. While bigger than Cabletron, Bay only managed to eke out a 2% increase in sales in 1997, inching up to $2 billion and posting a loss of $285 million in the process.

Cabletron and Bay are looking to new management to inspire growth, or at least they were. Cabletron just parted ways with Don Reed, the CEO it brought in seven months ago to bring big-business thinking to the New Hampshire hub maker. Co-founder Craig Benson says he and Reed decided Benson was the better person to implement the Reed vision.

Things are more stable over at Bay. CEO David House celebrated his first anniversary there in November to the applause of analysts and customers alike, who say he is bringing Bay back (see story, page 84).

Since the company's fiscal year ends June 30, the NW200 figures show little of what House has actually accomplished. For the first six months of fiscal 1998, Bay posted sales of $1.2 billion, up 20% compared with the same period last year. It posted $89 million in profits, compared with a loss of $167 million for the same period in 1997.

As part of its rebuilding effort, Bay last year acquired Gigabit Ethernet maker Rapid City Communications in a deal worth $155 million, which should help earn Bay a respectable showing in what will become an increasingly important race.

Rebuilding is also the watchword over at Novell, where CEO Eric Schmidt is valiantly trying to restore confidence in the badly shaken stalwart.

Although Schmidt was able to return the company to profitability in the fourth quarter last year (ended Oct. 31), losses in the two preceding quarters added up to $78 million worth of red ink on the year's revenue of $1 billion.

Most telling: The billion dollars in sales in 1997 was for all product lines — including NetWare, GroupWise and BorderManager — whereas two years earlier, Novell sold $1 billion worth of NetWare alone.

And while Schmidt has since put up another profitable quarter, the numbers continue to slide. First-quarter 1998 revenue of $252 million is down 7% from the previous quarter, largely because of weakness in the Asia-Pacific region, the company says.

ALPHABETICAL COMPANY LISTING

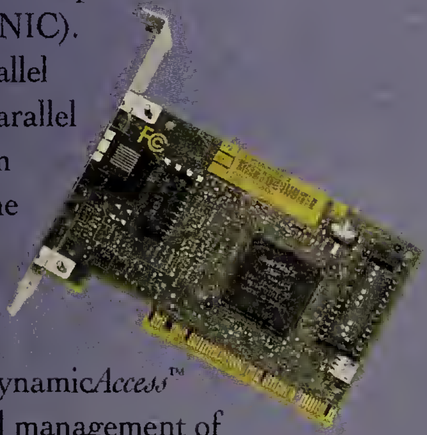
1997 Revenue Rank	Company	1997 Revenue Rank	Company	1997 Revenue Rank	Company	1997 Revenue Rank	Company	1997 Revenue Rank	Company
37	3Com	136	Centigram Comm.	79	Exide Electronics	26	NCR	126	Security Dynamics
177	ACT Networks	105	Centron DPL	103	FileNet	162	NetManage	190	SEEQ Technology
62	Adaptec	165	Centura Software	196	First Virtual	173	Netopia	70	Sequent Computer
59	ADC Telecommunications	65	Century Telephone Enterprise	89	FORE	187	Netrix	123	Shiva
63	Adobe Systems	143	CheckPoint Software	41	Frontier	82	Netscape	93	Siemens Pyramid Info. Sys.
100	ADTRAN	27	Cisco	153	FTP Software	77	Network Associates	35	Silicon Graphics
36	ALLTEL Mobile Comm.	130	Citrix Systems	155	Gandalf Systems	95	Network Equipment Tech.	117	Software AG Americas
48	America Online	9	Compaq	28	Gateway 2000	184	Network Peripherals	16	Sprint
164	American Comm.	45	CompuCom Systems	107	General DataComm	54	Newbridge Networks	92	Standard Microsystems
67	American Management Sys.	69	CompuServe	140	Global Village Comm.	14	Nortel	84	Sterling Software
66	American Power Conversion	34	Computer Associates	175	Graphnet	61	Novell	42	StorageTek
13	Ameritech	138	Computer Network Tech.	10	GTE	127	Network Computing	74	Stratus Computer
29	AMP	31	Computer Sciences	110	Hayes	180	ON Technology	21	Sun
68	Andrew	81	COMSAT	3	Hewlett-Packard	163	Open Market	64	Sybase
39	Anixter	96	Comverse Technology	60	Hughes Network Systems	139	Optical Data Systems	85	Symantec
181	Apertus Technologies	178	Concentric Network	137	Hummingbird Comm.	30	Oracle	71	Symbol Technologies
24	Apple	144	CYLINK	1	IBM	133	Osicom Technologies	129	Tekelec
166	Applied Voice Tech.	176	D-Link Systems	99	ICG Communications	98	Pairgain Technologies	46	Tektronix
186	Artisoft	51	Data General	97	Information Builders	169	PC DOCS	132	Telco Systems
142	Asante Technologies	124	Datapoint	75	Informix Software	183	Peregrine Systems	83	Teleport Comm. Group
58	Ascend Communications	146	Davox	185	Infoseek	86	PictureTel	56	Tellabs
90	Aspect Telecommunications	22	Dell Computer	7	Intel	33	Pitney Bowes	87	Telxon
2	AT&T	101	Dialogic	158	Interleaf	192	PlainTree Systems	161	Transaction Network
109	Auspex Systems	119	Digi International	198	Interlink Computer Sciences	76	Platinum Technology	200	UNIFY
152	AXENT Technologies	17	Digital	104	Intermedia Communications	135	Procom Technology	25	Unisys
149	Banyan Systems	156	Digital Link	157	Interphase	115	Progress Software	19	US WEST Communications
44	Bay Networks	118	Digital Microwave	78	Intuit	195	Proteon	32	US WEST Media One
72	Belden Wire & Cable	148	Documentum	147	Larscom	179	Proxim	167	Verilink
4	Bell Atlantic	50	DSC Communications	49	LCI International	131	PSINet	191	Voicetek
11	BellSouth	91	Dynatech	6	Lucent Technologies	43	Qualcomm	114	VTEL
80	BMC Software	168	Edify	12	MCI	141	Quarterdeck	125	Wall Data
151	Boca Research	15	EDS	182	Memotec Communications	47	Racal	170	Wandel & Goltermann Tech.
111	Boole & Babbage	134	Eicon Technology	189	Microlog	188	RealNetworks	55	Wang Laboratories
122	Borland International	38	EMC	18	Microsoft	128	Remedy	145	WinStar
113	Boston Technology	159	Emulex	172	MindSpring Enterprises	112	The Santa Cruz Operation	23	WorldCom
194	Broadvision	108	Equant Network Services	73	Mitel	52	SAP America	171	XcelleNet
150	Brooktrout Technology	193	Equinox Systems	88	Mobile Telecommunicators	8	SBC Communications	116	Xircom
53	Cabletron Systems	121	Everex Systems	5	Motorola	199	SBE	106	Xylan
102	California Microwave	94	Exabyte	120	MRV Communications	57	Scientific-Atlanta	154	Yahoo
197	Castelle	174	Excite	40	National Semiconductor	20	Seagate Technology	160	Zoom Telephonics

Performance^3

3Com® Fast EtherLink® XL 10/100 NIC:

Full Speed Ahead

Introducing 3Com's next generation Fast EtherLink XL 10/100 NIC with breakthrough Parallel Tasking® II performance. The solution for all your network hurdles.



3Com has the answer for your network's need for speed — the new Fast EtherLink® XL 10/100 network interface card (NIC).

Our newest 10/100 Mbps NIC introduces Parallel Tasking® II performance. The next step in our Parallel Tasking technology, it enables the NIC to stream larger portions of data across the PCI Bus for the highest throughput and lowest CPU utilization in the industry, for the best desktop application performance available.

The Fast EtherLink XL NIC also includes Dynamic*Access*™ software for optimized performance, control and management of your network. It features standards-based traffic prioritization for improved performance of mission critical applications, and dRMON SmartAgent® software for affordable network management. And Dynamic*Access* software upgrades are free.

As part of 3Com's Managed PC solution, this card also features Remote Wake Up, allowing network managers to remotely power up PCs for after-hours updates. DMI 2.0 support ensures compatibility with leading desktop management applications for superior control from startup through shutdown. The result — the lowest cost of ownership available.

So remember the Fast EtherLink XL NIC from the worldwide networking leader that has helped make over 100 million connections. And get your network moving today.

Call us today to get your $45 Fast EtherLink XL Evaluation Unit and more information.

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3Com
NETWORK
READY

3Com
Parallel Tasking II
PERFORMANCE

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Of course, many of Novell's problems can be blamed on the ascendency of Microsoft — and NT, in particular. It has become increasingly hard to fight Microsoft, not only in terms of marketing clout and installed base, but from a pure research and development perspective. One investment banker estimates that there is more than $20 billion worth of work involving Windows and Windows NT going on across the industry today. Compare that to Novell's $200 million in R&D in 1997.

In fact, by some accounts, Microsoft has become the largest software developer in the world, bypassing IBM for the first time ever. Annex Research (www.djurdjevic.com) says annualizing Microsoft's first half 1998 revenue (the company's fiscal year ends June 30) results in $13.3 billion, whereas IBM's 1997 software revenue was $12.8 billion.

Another company riding high on the PC wave is Compaq, which surged ahead 23% last year to close with sales of $24.5 billion. But even more impressive than the raw growth is what the company hopes to do next.

After acquiring Tandem last year, the company in January announced plans to absorb Digital. That addition would give Compaq a large base of enterprise customers, a world-class, worldwide service organization and a slew of NT

INVESTING

Companies that spent the most on R&D in 1997

1997 Revenue Rank	Company	1997 R&D%*
163	Open Market	56%
153	FTP Software	40%
122	Borland International	36%
198	Interlink Computer Sciences	31%
76	Platinum Technology	30%
200	UNIFY	29%
186	Artisoft	28%
184	Network Peripherals	28%
61	Novell	28%
110	Hayes	28%
181	Apertus Technologies	26%
194	Broadvision	26%
107	General DataComm	26%
169	PC DOCS	26%
191	Voicetek	26%

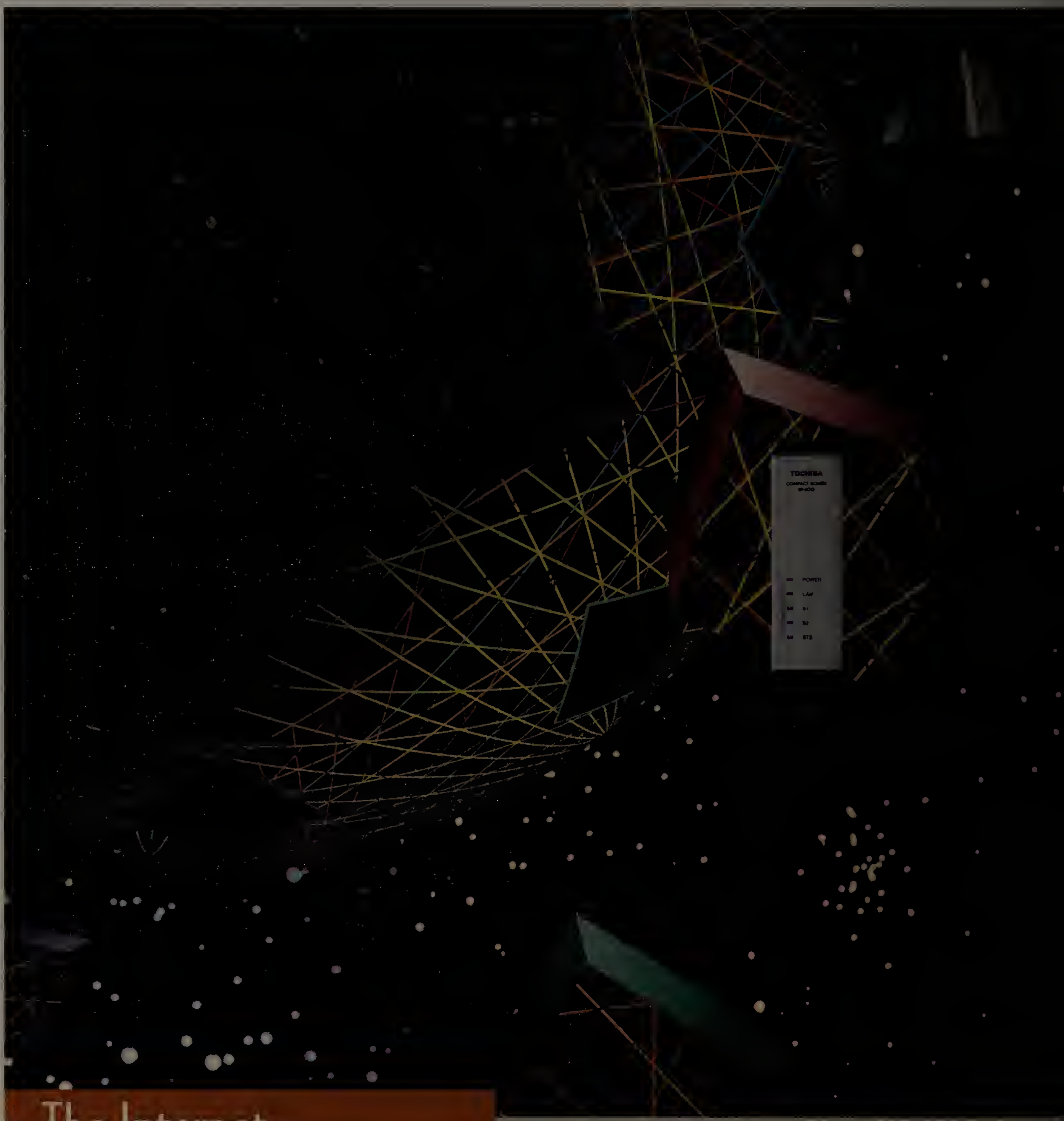
*As percentage of 1997 sales

VALUE PACKED

Highest value companies of 1997

1997 Revenue Rank	Company	Market capitalization*
18	Microsoft	$199.4
7	Intel	$123.9
2	AT&T	$107.1
1	IBM	$99.2
4	Bell Atlantic	$81.2
8	SBC Communications	$80.7
6	Lucent Technologies	$78.2
27	Cisco	$65.1
3	Hewlett-Packard	$64.9
11	BellSouth	$63.9
10	GTE	$56.8
13	Ameritech	$53.1
22	Dell Computer	$40.8
23	WorldCom	$39.4
9	Compaq	$35.3

*Value of outstanding stock in billions as of March 20, 1998



The Internet

It's exciting. Powerful. A brave new world wide web of information and productivity.

Granted, there are still a few holes that need to be plugged, and Toshiba is just the company to do it. With more expertise in more fields of technology, we've got the "big picture" advantage in solving global IT challenges.

What's Your Net Worth?

Billions are being spent to provide information access via enterprise networks. But access can be a Pandora's Box, so many more millions will need to be spent by corporations just to prevent unauthorized access.

Toshiba's **Network CryptoGate (NCG)** solves a problem common to Virtual Private Network systems — security compromised by remote users. NCG permits secure access from any remote terminal, anywhere, anytime. And the client-installed software is completely transparent to the user. The system uses only open software standards and is entirely modular, so it can be expanded to protect any size enterprise.

ISDN Power Plug-Ins. The TR Series Routers.

Launched late in 1997, the TR-602 Compact Router now shares the SOHO spotlight with the new **TR-653 Compact Router.** In addition to ISDN speed and a built-in 4-port hub, it boasts full telephone and fax connectivity. It's a high-speed access solution anyone can afford.

developers that is rivaled only by the group Compaq has already assembled.

The merged entity could end up with revenue of around $35 billion, making it close to half the size of IBM. And more deals are probably on the way. Who's next? Maybe Sun — to further reduce Compaq's reliance on Microsoft and Intel.

The Compaq/Digital alliance is one of those things that could change the chemistry of the industry this year, like the MCI/WorldCom deal. Done right, acquisitions such as these result in the whole being greater than the sum of the parts. Less clear is whether 3Com teaming up with U.S. Robotics offers similar leverage.

One thing is clear: The urge to merge is doing anything but abating. The industry is still hellbent on the idea that bigger is better. We can expect to see the trend extend throughout this year (see story, page 85). This is particularly true in telecommunications, where the big guys will continue to chase other big guys and small fries alike, and in data communications equipment, where Cisco, 3Com, Bay and Cabletron will be casting about among newcomers, looking for the next great advance.

And Microsoft? Acquisitions or not, next year it will probably be bigger than Walgreens, Alcoa and Goodyear. ■

PRODUCTIVITY

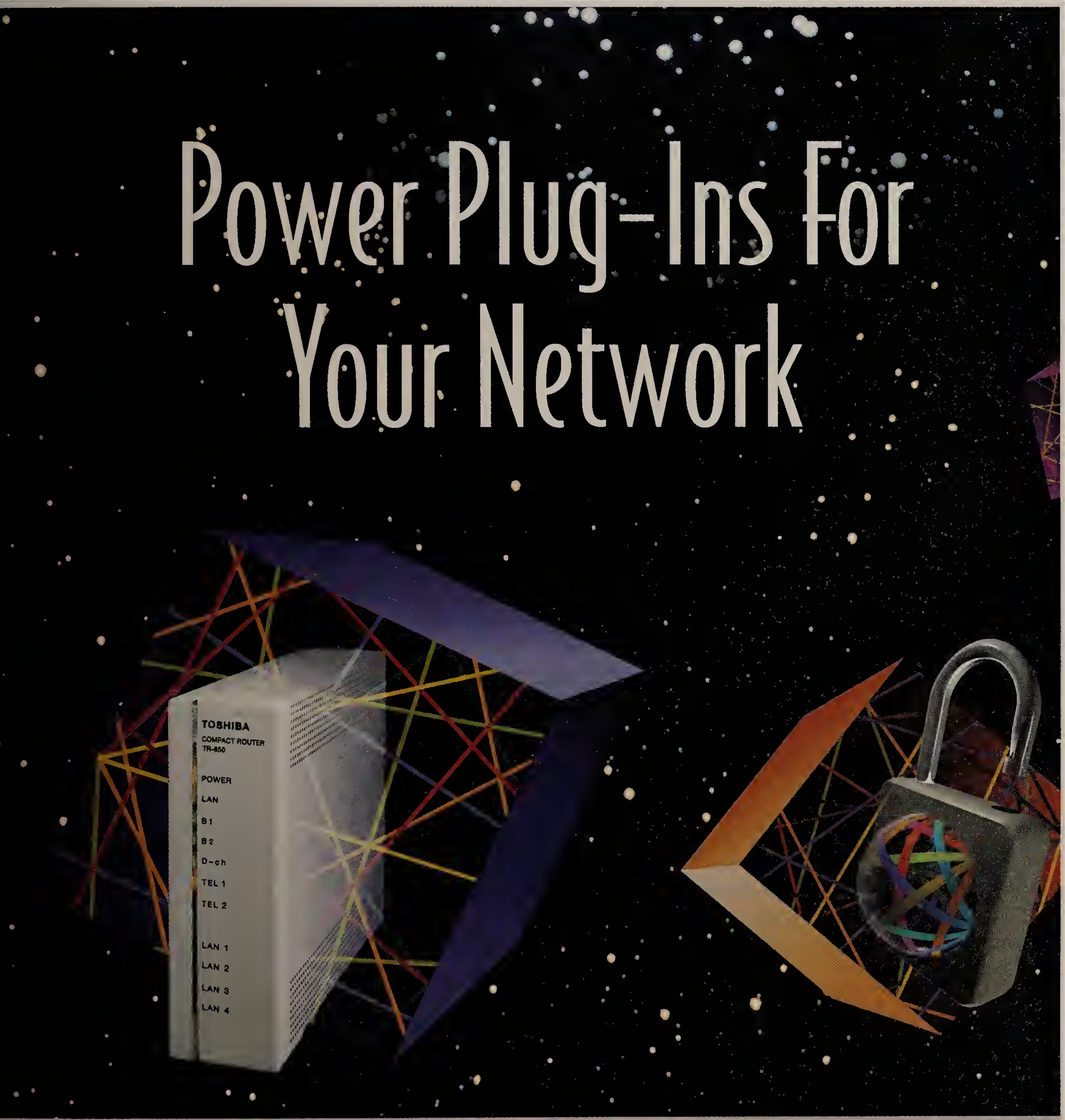
Most revenue per employee

1997 Revenue Rank	Company	Revenue per employee 1997
121	Everex Systems	$794,872
9	Compaq	$744,969
24	Apple	$708,000
27	Cisco Systems	$640,000
105	Centron DPL	$635,821
58	Ascend Communications	$633,550
52	SAP America	$543,520
23	WorldCom	$525,071
18	Microsoft	$510,885
161	Transaction Network	$506,400
93	Siemens Pyramid Info.	$500,000
39	Anixter	$500,000
45	CompuCom Systems	$487,500
28	Gateway 2000	$484,182
176	D-Link Systems	$471,698
38	EMC	$466,667
190	SEEQ Technology	$448,900

GLOBAL ECONOMY

Leaders in overseas sales

1997 Revenue Rank	Company	% International revenue 1998 (estimated)
177	ACT Networks	75%
74	Stratus Computer	65%
120	MRV Communications	65%
198	Interlink Computer	64%
111	Boole & Babbage	60%
165	Centura Software	60%
122	Borland International	59%
25	Unisys	58%
5	Motorola	58%
3	Hewlett-Packard	56%
26	NCR	55%
30	Oracle	55%
92	Standard Microsystems	55%
24	Apple	50%



But what really sets the TR-Series Compact Routers apart are extras like a super simple setup using only your familiar web browser. And a built-in power supply that won't cover half of your power strip when you plug it in. ISDN doesn't get any easier than this.

Toshiba. A Smart Partner To Network With.

Peeling back Internet layers, we find countless supporting technologies, many of which were developed by Toshiba. Toshiba's new **Network Products Division** is charged with bringing to market advanced networking products such as high-speed switches, routers, enterprise software for Virtual Private Networks, and much more, soon to be announced.

NETWORK PRODUCTS DIVISION

To start networking with Toshiba, visit our web site at **www.networks.toshiba.com** for product information, an informative white paper and more.

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NETWORK WORLD TWO HUNDRED

1997 Revenue Rank	1996 Revenue Rank	Company	1997 Revenue				1997 Profits			Profit Rank	Mkt. Cap.	Stock Symbol	Number of Employees			R&D		Year Inc.	Fiscal Year Ends	Web Address
			$M	'96-'97 %Δ	'92-'97 CAGR*	Int'l %	$M	'96-'97 %Δ	'92-'97 CAGR		$M 3/20/98		1997	'96-'97 %Δ	'92-'97 CAGR	% Rev. 1996	% Rev. 1997			
1	1	IBM	78.508	3%	4%		6,093.0	12%		2	99,200	IBM	269,465			6%	6%	1911	12/31	ibm
2	2	AT&T	51,319	2%			4,638.0	-21%		3	107,100	T	128,000					1885	12/31	att
3	3	Hewlett-Packard	42,895	12%	21%	56%	3,119.0	21%	42%	6	64,900	HWP	121,900	9%	6%	7%	7%	1939	10/31	hp
4	4	Bell Atlantic	30,194	4%		1%	2,454.9	-22%		8	81,200	BEL	141,000					1984	12/31	bellatlantic
5	5	Motorola	29,800	7%	18%	58%	1,180.0	2%	15%	13	32,300	MOT	150,000	8%	7%	9%	9%	1928	12/31	mot
6	7	Lucent Technologies	26,360	13%		24%	541.0			22	78,200	LU	129,500	7%		11%	11%	1996	9/30	lucent
7	9	Intel	25,070	20%	34%	44%	6,945.0	35%	45%	1	123,900	INTC	64,000	32%	20%	9%	9%	1968	12/31	intel
8	6	SBC Communications	24,856	6%			1,474.0	-55%		11	80,700	SBC	116,000					1983	12/31	sbc
9	10	Compaq	24,584	23%	43%		1,855.0	41%	54%	10	35,300	CPQ	32,565			3%	3%	1982	12/31	compaq
10	8	GTE	23,260	9%	4%	12%	2,794.0	0%	29%	7	56,800	GTE	114,000		-2%	1%	1%	1935	12/31	gte
11	11	BellSouth	20,561	8%	6%		3,261.0	14%	15%	5	63,900	BLS	81,241	0%				1984	12/31	bellsouth
12	12	MCI	19,653	6%	13%		2.0	-99%	-68%	102	27,800	MCIC	N/A					1968	12/31	mci
13	13	Ameritech	15,998	7%			2,296.0	8%		9	53,100	AIT	74,000	12%				1983	12/31	ameritech
14	17	Nortel	15,449	20%	13%	37%	829.0	33%	9%	17	32,600	NT	73,000			14%	14%	1895	12/31	nortel
15	15	EDS	15,236	6%	13%		730.6	69%	3%	20	24,700	EDS	100,000					1962	12/31	eds
16	16	Sprint	14,820	6%	8%		953.0	-19%		16	25,300	FON	51,000					1899	12/31	sprint
17	14	Digital	13,047	-10%	-1%		140.9			38	7,040	DEC	54,900	-7%	-13%	7%	8%	1957	6/30	digital
18	20	Microsoft	11,358	31%	33%	22%	3,454.0	57%	37%	4	199,400	MSFT	22,232	8%	13%	17%	17%	1975	6/30	microsoft
19	18	US WEST Communications	10,300	2%			1,100.0	-8%		14	26,900	USW	47,568	-1%				1984	12/31	uswest
20	21	Seagate Technology	8,900	5%	25%		658.0	209%	60%	21	5,720	SEG	100,000	18%	20%		5%	1979	6/30	seagate
21	22	Sun	8,598	21%	19%		762.4	60%	34%	19	16,200	SUNW	21,553	24%	11%	9%	10%	1982	6/30	sun
22	26	Dell Computer	7,759	47%	54%		518.0	90%	59%	25	40,800	DELL	11,000			2%	2%	1984	1/31	dell
23	29	WorldCom	7,351	64%			363.8			29	39,400	WCOM	14,000					1987	12/31	wcom
24	19	Apple	7,081	-28%	0%	50%	(1,045.0)			180	3,500	AAPL	8,437			6%	7%	1977	9/30	apple
25	24	Unisys	6,636	4%	0%	58%	(853.7)			179	4,950	UIS	32,600	-1%	-5%	5%	4%	1986	12/31	unisys
26	23	NCR	6,600	-6%		55%	7.0	-94%		88	3,420	NCR	38,300	-1%		5%	6%	1884	12/31	ncr
27	31	Cisco	6,400	56%	76%	44%	1,413.9	53%	77%	12	65,100	CSCO	10,000	21%	63%	10%	11%	1987	7/31	cisco
28	27	Gateway 2000	6,294	25%			109.8	-56%		41	6,390	GTW	13,000					1985	12/31	gw2k
29	25	AMP	5,745	5%	9%		473.0	65%	9%	26	9,250	AMP	45,600			11%		1941	12/31	amp
30	30	Oracle	5,684	35%	37%	55%	821.5	36%	68%	18	28,500	ORCL	29,431	27%	29%	9%	10%	1977	5/31	oracle
31	28	Computer Sciences	5,616	18%	22%	32%	192.4	76%	23%	34	6,380	CSC	40,980	8%				1959	3/31	csc
32	35	US WEST Media One	5,000	67%			(500.0)			178	21,400	UMG	21,249					1984	12/31	uswest
33	32	Pitney Bowes	4,100	6%	7%	16%	526.0	12%	39%	24	14,400	PBI	29,901	4%	1%	2%	2%	1920	12/31	pitneybowes
34	33	Computer Associates	4,040	15%	22%	34%	964.0	28%	43%	15	28,500	CA	9,245	9%		8%	8%	1974	3/31	cai
35	34	Silicon Graphics	3,700	9%	34%		79.0	-31%		46	2,640	SGI	10,500	0%	24%	11%	13%	1982	6/30	sgi
36	36	ALLTEL Mobile Comm.	3,221	10%	13%						8,170	AT	16,393	1%	5%			1983	1/31	alltel
37	40	3Com	3,147	35%	50%		374.0	110%		28	11,800	COMS	7,109	37%	30%	10%	11%	1979	5/31	3com
38	41	EMC	2,940	29%	50%		539.0	40%	79%	23	18,800	EMC	6,300			7%		1979	12/31	emc
39	39	Anixter	2,800	12%		27%	45.3	25%		57	927	AXE	5,600					1957	12/31	anixter
40	37	National Semiconductor	2,507	-4%	8%		27.5	-85%		71	3,240	NSM	12,400	-39%	-15%	13%	15%	1959	5/31	national
41	38	Frontier	2,353	-9%	13%		54.6	-74%	-12%	54	5,270	FRO	7,444	-6%	3%			1899	12/31	frontiercorp
42	43	StorageTek	2,145	5%			231.8	29%		32	3,910	STK	8,300			9%	10%	1969	12/31	storagetek
43	60	Qualcomm	2,096	158%			91.9	337%		44	3,290	QCOM	7,095	43%	55%	20%	11%	1985	9/30	qualcomm
44	42	Bay Networks	2,093	2%	-52%	35%	(285.0)			175	6,030	BAY	5,960			10%	13%	1994	6/30	baynetwork
45	44	CompuCom Systems	1,950	-3%	22%	3%	31.8	4%	34%	66	394	CMPC	4,000	8%	27%			1987	12/31	compucom
46	45	Tektronix	1,940	10%	8%	47%	114.8	15%	42%	40	2,380	TEK	8,392	6%	-6%	9%	10%	1946	5/31	tek
47		Racal	1,900								N/A		13,000					1950	3/31	racal
48	51	America Online	1,680	54%			(5.2)			123	13,100	AOL	7,371	38%		4%	3%	1992	6/30	aol
49	49	LCI International	1,642	49%			31.0	-58%		68	3,820	LCI	3,900	36%				1983	12/31	lci
50	46	DSC Communications	1,564	13%	24%		48.9			55	2,010	DIGI	6,600					1976	12/31	dsccc
51	48	Data General	1,533	16%	7%		55.9	99%		53	828	DGN	5,100			7%	7%	1968	9/30	dg
52		SAP America	1,430								N/A	SAPHY	2,631	52%				1972	12/31	sap
53	50	Cabletron Systems	1,407	28%	37%		222.1	54%	31%	33	2,370	CS	6,607			12%	11%	1983	2/28	cabletron
54	56	Newbridge Networks	1,377	49%			156.9	-23%		37	4,780	NN	6,200			11%	11%	1986	4/30	newbridge
55	53	Wang Laboratories	1,268	25%			69.9			49	1,180	WANG	9,300	50%		0%	0%	1951	6/30	wang
56	58	Tellabs	1,204	39%	36%		263.7	124%	73%	30	11,900	TLAB	4,087			12%	13%	1975	12/31	tellabs
57	52	Scientific-Atlanta	1,168	11%	18%	38%	64.0			51	4,560	SFA	5,480	17%	13%	9%	10%	1951	6/30	sciatl
58	57	Ascend Communications	1,167	31%		31%	(124.4)			170	6,030	ASND	1,842	19%		11%	13%	1989	12/31	ascend
59	59	ADC Telecommunications	1,164	41%	30%	21%	108.8	24%	39%	42	3,360	ADCT	6,000	30%	21%	11%	11%	1935	10/31	adc
60	55	Hughes Network Systems	1,100	10%	23%		449.7	177%		27	4,710	GMH	3,600	20%	15%			1971	12/31	hns
61	47	Novell	1,007	-27%	-8%	45%	(78.3)			164	3,540	NOVL	4,800	-17%		20%	28%	1983	10/31	novell
62	69	Adaptec	934	42%	44%		107.6	4%	49%	43	2,520	ADPT	3,000		25%	13%	14%	1981	3/31	adaptec
63	63	Adobe Systems	912	16%			186.8	22%		35	2,970	ADBE						1982	11/30	adobe
64	54	Sybase	904	-11%	25%		(55.4)			158	744	SYBS						1984	12/31	sybase
65	65	Century Telephone	902	20%	19%		256.0	478%	15%	31	3,630	CTL	5,700	71%	19%			1955	12/31	centurytel
66	67	American Power Conversion	873	24%	41%	40%	121.8	32%	34%	39	2,620	APCC	3,110	17%	33%	2%	3%	1981	12/31	apcc
67	61	American Management Sys.	872	7%	21%	29%	31.2	101%	10%	67	1,180	AMSY	7,570	11%	18%			1979	12/31	amsinc

1997 Revenue Rank	Chair	CEO	President	Sales	Products and Services	Notes
1	Louis V. Gerstner Jr.	Louis V. Gerstner Jr.	Ned C. Lautenbach		Computer and network products and services	
2	C. Michael Armstrong	C. Michael Armstrong	John D. Zeglis		Long-distance telecom, computer and network products and services	
3	Lewis E. Platt	Lewis E. Platt	Lewis E. Platt	Richard Watts	Products/services for measurement, computing, communications	
4	Raymond W. Smith	Raymond W. Smith	Ivan G. Seidenberg	James G. Cullen	Local telecom, wireless, directory, entertainment, information services	
5	Gary Tooker	Christopher Galvin	Robert Growney		Wireless, semiconductors, cellular phones, two-way radio, pagers	
6	Henry B. Schacht	Richard A. McGinn	Richard A. McGinn		Public and private network gear, business telephone systems	Spinoff from AT&T (1996)
7	Andrew S. Grove	Craig R. Barrett (5/20)	Craig R. Barrett	Sean Maloney	Semiconductors, PC, network, communications products	
8	Edward E. Whitacre Jr.	Edward E. Whitacre Jr.			Local, long-distance,cellular telephone services	
9	Benjamin M. Rosen	Eckhard Pfeiffer	Eckhard Pfeiffer	Michael D. Heil	Servers, desktops, networking products, home PCs, notebooks	
10	Charles R. Lee	Charles R. Lee	Kent B. Foster		Telecommunications	
11	Duane Ackerman	Duane Ackerman			Local telecom, wireless, directory, video and information services	
12	Bert C. Roberts	Bernard J. Ebbers	Bernard J. Ebbers		Long-distance, global telecom and information services	To merge with WorldCom second half '98
13	Richard C. Notebaert	Richard C. Notebaert			Local/long-distance telecom, video communication, online services	
14	Donald J. Schuenke	John A. Roth	John A. Roth		Public and private network gear, multimedia conferencing systems	Canadian company
15	Lester M. Alberthal Jr.	Lester M. Alberthal Jr.	Jeffrey M. Heller		Computer/communications technologies provider	
16	William T. Esrey	William T. Esrey	Ronald T. LeMay		Global voice, data and video services and related products	
17	Robert B. Palmer	Robert B. Palmer	Robert B. Palmer	Bruce L. Claflin	Computer and network products and services	Subsidiary, Compaq Computer (1/98)
18	William H. Gates	William H. Gates		Steven A. Ballmer	PC operating systems, applications and accessories	
19	Richard D. McCormick	Solomon Trujllo	Solomon Trujllo		Telecommunications	Subsidiary, US WEST (est. mid-1998)
20	Al Shugart	Al Shugart	Steve Luczo	Bernie Carballo	Disk/tape drives, storage/network/info. management software	
21	Scott McNealy	Scott McNealy	Scott McNealy		Enterprise network computing hardware/software/services	
22	Michael Dell	Michael Dell			PCs and peripherals	
23	Bert C. Roberts	Bernard J. Ebbers	Bernard J. Ebbers		Long-distance telephone services	To merge with MCI second half '98
24		Steve Jobs			Personal systems, software, servers, communications	
25	Lawrence A. Weinbach	Lawrence A. Weinbach	Lawrence A. Weinbach		Computers, information services and systems integration	
26	Lars Nyberg	Lars Nyberg			Data warehousing, communications	
27	John P. Morgridge	John T. Chambers	John T. Chambers	Gary Daichendt	Routers, LAN/WAN/ATM switches, dial-access servers, mgmt. software	
28	Theodore W. Waitt	Theodore W. Waitt	Jeffrey Weitzen		Personal systems, servers	
29	James E. Marley	William J. Hudson	William J. Hudson		Electric/electronic connection, cabling, LAN interconnect systems	
30	Lawrence J. Ellison	Lawrence J. Ellison	Raymond J. Lane		Database software, information management services	
31	Van B. Honeycutt	Van B. Honeycutt	Van B. Honeycutt		Management consulting, systems integration, outsourcing	
32	Richard D. McCormick	Charles Lillis	Charles Lillis		Broadband/telecom services	Subsidiary, US WEST (est. mid-1998)
33	Michael J. Critelli	Michael J. Critelli	Marc C. Breslawsky		Mail and messaging management	
34	Charles B. Wang	Charles B. Wang	Sanjay Kumar	Rich Chiarello	Systems/application software, systems/management databases	
35	Richard Belluzzo	Richard Belluzzo		Evan Ellis	Servers, workstations, supercomputers, semiconductors	
36		Joe T. Ford	Scott T. Ford		Wire-line and wireless communications	
37	Eric A. Benhamou	Eric A. Benhamou	Ralph Godfrey	Alan J. Kessler	Data network equipment, internetworking/remote access	
38	Richard J. Egan	Michael C. Ruettgers	Michael C. Ruettgers		Storage management systems, data migration, backup facilities	
39		Robert W. Grubbs	Robert W. Grubbs		Cabling/network systems for data/voice/video applications	Subsidiary, Anixter International
40	Brian L. Halla	Brian L. Halla	Brian L. Halla	Michael Bereziuk	Analog/digital signal chips, video technology, data compression	
41		Joe Clayton	Joe Clayton	Donna L. Reeves	Local/long-distance telecom, audio/videoconferencing, Internet	
42	David E. Weiss	David E. Weiss	David E. Weiss		Tape/disk software, routers	Subsidiary, Storage Technology
43	Irwin M. Jacobs	Irwin M. Jacobs	Harvey P. White		Digital wireless communications	
44	David L. House	David L. House	David L. House	Michael K. Gallagher	Network management, LAN support products	
45	Charles Root	Ed Anderson	Ed Anderson	Dan Brown	Network/PC integration, management, support, procurement	Subsidiary, Safeguard Scientifics
46	Jerome J. Meyer	Jerome J. Meyer	Jerome J. Meyer		Measurement, color printing, imaging, video, networking	
47	Paul Kozlowski	Paul Kozlowski	Louis P. Bender		Network access gear, fiber, managed networks	Subsidiary, Racal (Great Britain)**
48	Stephen M. Case	Stephen M. Case	Robert W. Pittman		Internet access	
49	H. Brian Thompson	H. Brian Thompson		Marshall Hanno	Local/long-distance telecom, Internet access, net management	
50	James L. Donald	James L. Donald			Switching/transmission/access/management systems	
51	Frederick R. Adler	Ronald L. Skates	Ronald L. Skates		Servers, storage systems and related software and services	
52	H.C. Hasso Plattner	Paul Wahl	Jeremy Coote		Business application software	Subsidiary, SAP AG (Ger.)**
53	Craig R. Benson	Craig R. Benson			Ethernet, token ring, FDDI, ATM, remote access	
54	Terence H. Matthews	Terence H. Matthews	Peter D. Charbonneau		WAN equipment, network management, channel banks	Canadian company
55	Joseph M. Tucci	Joseph M. Tucci			Imaging software, network integration	
56		Michael J. Birck	Michael J. Birck		Digital cross-connect systems, network access systems	
57	James V. Napier	James F. McDonald	James F. McDonald	Larry Enterline	Broadband telecom, satellite-based video/voice/data networks	
58		Mory Ejabat	Mory Ejabat	Michael Hendren	Remote, LAN/Internet/multimedia access, videoconferencing	
59	William J. Cadogan	William J. Cadogan	William J. Cadogan		Transmission/networking, broadband, network integration	Subsidiary, Teleport Comm. Group (11/97)
60	Jack Shaw	Jack Shaw	Pradman Kaul		VSAT, cellular, LAN/WAN internetworking, frame relay, ATM	Unit of Hughes Electronics (Mkt. Cap.=parent)
61	Eric E. Schmidt	Eric E. Schmidt		Ronald E. Heinz	Network operating systems, applications, distributed services	
62	Grant Saviers	Grant Saviers	Grant Saviers	Dick Gourley	Adapters, interface cards, ATM, recordable CD, RAID	
63	Drs. Geschke and Warnock	John E. Warnock	Charles M. Geschke	Richard Dyer	Graphics/layout, multimedia, Internet publishing	
64	Mitchell E. Kertzman	Mitchell E. Kertzman	John S. Chen	Mike Gardner	Databases, middleware, e-commerce, data warehousing	
65	Clarke M. Williams	Glen F. Post III	Glen F. Post III		Local exchange, wireless, long-distance and Internet access	
66	Rodger B. Dowdell Jr.	Rodger B. Dowdell Jr.	Rodger B. Dowdell Jr.		Uninterruptible power supplies, power protection/conditioning	
67	Paul A. Brands	Paul A. Brands	Philip M. Giuntini		Business and information technology consulting	

1997 Revenue Rank	1996 Revenue Rank	Company	1997 Revenue $M	1997 Revenue '96-'97 %Δ	1997 Revenue '92-'97 CAGR	Int'l %	1997 Profits $M	1997 Profits '96-'97 %Δ	1997 Profits '92-'97 CAGR	Profit Rank	Mkt. Cap. $M 3/20/98	Stock Symbol	Number of Employees 1997	Number of Employees '96-'97 %Δ	Number of Employees '92-'97 CAGR	R&D % Rev. 1996	R&D % Rev. 1997	Year Inc.	Fiscal Year Ends	Web Address
68	64	Andrew	869	14%	17%	22%	88.3	-2%	28%	45	1,800	ANDW	4,227	-9%	6%	4%	5%	1937	9/30	andrew
69	62	CompuServe	842	6%		29%	(119.8)			169	N/A	AOL	3,050	16%		4%	3%	1969	4/30	compuserve
70	72	Sequent Computer	834	40%			38.7			63	769	SQNT	2,600					1983	12/31	sequent
71	70	Symbol Technologies	774	18%			70.2	40%		48	1,960	S8L				9%	7%	1973	12/31	symbol
72	68	Belden Wire & Cable	747	12%	15%	33%	60.6	10%	26%	52	1,070	8WC	4,500	7%	10%	1%	1%	1993	12/31	belden
73	73	Mitel	696	21%	11%	43%	38.0	-25%	46%	64	1,440	MLT	4,079	5%	2%	7%	8%	1971	3/31	mitel
74	71	Stratus Computer	688	13%		65%	74.1	70%		47	1,150	SRA						1980	12/31	stratus
75	66	Informix Software	662	-9%			(356.9)			177	1,260	IFMX	3,600			17%	21%	1980	12/31	informix
76	78	Platinum Technology	624	33%	34%		(117.8)			168	1,510	PLAT	4,000			33%	30%	1987	12/31	platinum
77	83	Network Associates	612	45%	17%	28%	(28.0)			146	4,510	NETA	1,600	28%	11%	12%	14%	1989	12/31	nai
78	75	Intuit	599	11%			68.3			50	2,180	INTU						1983	7/31	intuit
79	79	Exide Electronics	578	26%							N/A					3%		1962	9/30	exide
80	82	BMC Software	563	31%	25%	38%	163.9	55%	29%	36	8,060	8MCS				14%	14%	1980	3/31	bmc
81	74	COMSAT	563	3%	4%	100%	28.6	-21%	-13%	69	1,780	CQ	1,367	10%	5%	2%	2%	1963	12/31	comsat
82	86	Netscape	534	54%			(115.5)			167	1,720	NSCP	1,811			24%	24%	1994	10/31	netscape
83	100	Teleport Comm. Group	494	134%			(222.7)			172	3,570	TCGI					4%	1983	12/31	tcg
84	81	Sterling Software	489	11%	11%		(133.0)			171	2,140	SSW	3,100			5%		1981	9/30	sterling
85	80	Symantec	472	6%	17%		26.0			73	1,540	SYMC	2,000			21%	18%	1982	3/31	symantec
86	76	PictureTel	466	-5%	27%	43%	(39.4)			152	253	PCTL	1,544	3%	18%	13%	17%	1984	12/31	picturetel
87	77	Telxon	466	-4%	17%	24%	(7.1)			128	404	TLXN	1,600	-24%	3%	9%	9%	1969	3/31	telxon
88	85	Mobile Telecommunications	408	17%	26%						1,360	MTEL	2,100	0%				1987	12/31	skytel
89	98	FORE Systems	395	68%	228%	37%	41.5	328%	115%	59	1,470	FORE	1,361	39%		13%	14%	1990	3/31	fore
90	89	Aspect Telecommunications	390	26%	41%	28%	35.0	-7%	43%	65	1,500	ASPT	1,614	21%	34%	11%	12%	1985	12/31	aspect
91	90	Dynatech	362	24%	-3%						818	DYT	2,200					1985	3/31	dytc
92	87	Standard Microsystems	354	4%	22%	55%	(21.3)			143	149	SMSC	793	-8%		9%	7%	1971	2/28	smc
93		Siemens Pyramid Info. Sys.	350								N/A	Private	700					1981	9/30	siemens-pyramic
94	84	Exabyte	336	-8%			(30.8)			150	206	EX8T	1,500			10%	12%	1985	12/31	exabyte
95	88	Network Equipment Tech.	324	-4%	12%		24.0	-23%		75	330	NWK	1,367	4%	6%	11%	13%	1987	3/31	net
96	102	Comverse Technology	296	43%	42%		43.5	55%	49%	58	1,190	CMVT				13%		1984	12/31	comverse
97	92	Information Builders	287	9%		30%					N/A	Private	1,750	0%				1975	12/31	ibi
98	103	Pairgain Technologies	282	37%	97%		47.6	36%		56	1,440	PAIR	640	32%	72%	9%	11%	1988	12/31	pairgain
99	106	ICG Communications	273	43%	105%		(327.6)			176	1,440	ICGX	2,219	71%				1996	12/31	icgcomm
100	94	ADTRAN	265	6%	36%	9%	40.2	1%	24%	61	1,130	ADTN	1,009	13%	25%	10%	11%	1986	12/31	adtran
101	99	Dialogic	261	22%			21.8	-15%		77	690	DLGC	1,000			19%	20%	1983	12/31	dialogic
102	96	California Microwave	254	6%		29%	0.2	-80%		110	343	CMIC	1,912	41%		7%	7%	1968	6/30	calmike
103	91	FileNet	251	-7%	13%		(5.5)			124	663	FILE				14%	16%	1982	12/31	filenet
104	130	Intermedia Communications	248	140%	104%		(241.1)			173	1,050	ICIX	2,056	135%	111%			1986	12/31	intermedia
105	107	Centron DPL	213	15%	18%	13%					N/A	Private	335	58%	23%			1984	12/31	centrondpl
106	119	Xylan	211	64%			24.1	58%		74	1,030	XYLN				12%	12%	1993	12/31	xylan
107	97	General DataComm	208	-12%	1%	24%	(42.7)			154	118	GDC	1,809	0%	1%	19%	26%	1969	9/30	gdc
108	125	Equant Network Services	204	85%							N/A	Private	525	46%				1991		equant
109	112	Auspex Systems	202	24%	32%	30%	13.4	-32%	22%	82	216	ASPX	600			11%	12%	1987	6/30	auspex
110	93	Hayes	200	-22%	3%	3%	(81.1)			165	N/A	Private	600	-18%	-8%	4%	28%	1978	12/31	hayes
111	108	Boole & Babbage	197	9%	12%	60%	13.5	18%	19%	81	658	BOOL	871	12%	6%	12%	13%	1967	9/30	boole
112	101	The Santa Cruz Operation	194	-7%	3%		(15.2)			137	172	SCOC	1,082			19%	24%	1979	9/30	sco
113	127	Boston Technology	192	83%	40%	30%	14.1			80	N/A	CMVT				21%	20%	1986	1/31	bostontechnolog
114	134	VTEL	191	97%	49%		(52.1)			157	135	VTEL	734			14%	13%	1986	7/31	vtel
115	110	Progress Software	188	7%	17%		(1.6)			117	351	PRGS	1,100			14%	14%	1981	11/30	progress
116	111	Xircom	185	11%			(9.9)			132	294	XIRC				6%	7%	1988	9/30	xircom
117	113	Software AG Americas	181	16%	8%	15%	6.7	8%	4%	89	557	AGS	952	22%	5%	1%	1%	1981	12/31	sagafyi
118	115	Digital Microwave	178	19%	16%		11.7			83	541	DMIC	665	15%	6%	7%	6%	1984	3/31	dmcwave
119	105	Digi International	166	-15%	19%	24%	(15.8)			139	355	DGII	481	-31%	13%	11%	11%	1985	9/30	dgii
120	136	MRV Communications	165	86%	106%	65%	22.5			76	629	MRVC	410	16%		9%	8%	1988	12/31	mrv
121	120	Everex Systems	155	24%		6%					N/A	Private	195	18%				1983	8/31	everex
122	95	Borland International	151	-38%	-21%	59%	(108.0)			166	343	8ORL				21%	36%	1983	3/31	borland
123	104	Shiva	144	-28%	22%		(13.6)			134	298	SHVA				11%	18%	1985	12/31	shiva
124	109	Datapoint	142	-21%			2.4	-88%		100	54	DPT	641	-9%				1968	7/31	datapoint
125	116	Wall Data	141	1%	35%		2.3	-45%	-18%	101	143	WALL				16%	14%	1982	12/31	walldata
126	138	Security Dynamics	136	62%	61%	27%	16.0	23%	68%	79	1,580	SDTI	600	67%	52%	15%	15%	1984	12/31	securitydynamic
127	121	Network Computing	133	11%			2.7			99	168	NCDI				12%		1988	12/31	ncd
128	139	Remedy	129	60%	119%	37%	27.3	63%		72	575	RMDY	643	56%	100%	16%	16%	1990	12/31	remedy
129	142	Tekelec	125	74%	17%	31%	1.0			108	1,030	TKLC	427	18%	0%	24%	17%	1979	12/31	tekelec
130	163	Citrix Systems	124	178%	128%	19%	41.4	121%	62%	60	1,990	CTXS	301	106%	44%	9%	6%	1989	12/31	citrix
131	135	PSINet	122	36%	80%		(45.6)			155	394	PSIX	772	56%				1989	12/31	psi.net
132		Telco Systems	117								113	TELC						1972	8/31	telco
133	171	Osicom Technologies	116	236%			(15.6)			138	79	FI8R				5%	5%	1981	1/31	osicom
134	124	Eicon Technology	111	0%			(28.5)			147	N/A	N/A	500					1984	6/30	eicon

1997 Revenue Rank	Chair	CEO	President	Sales	Products and Services	Notes
68	Floyd L. English	Floyd L. English	Floyd L. English		Coaxial cable/connectors/access, microwave, wireless	
69	Steve Case	Steve Case	Mayo Stuntz Jr.		Internet/intranet infrastructure, remote access	Subsidiary, America Online (10/97)
70	Casey Powell	Casey Powell	John McAdam	Peter O'Neil	Symmetric multiprocessing, decision support	
71	Jerome Swartz	Jerome Swartz	Tomo Razmilovic	Richard Bravman	Wireless LAN, handheld computers, bar code scanning	
72	C. Baker Cunningham	C. Baker Cunningham	C. Baker Cunningham	Michael Murphy	Copper/fiber-optic network cables	
73	Henry Simon	John Millard	John Millard	Kirk Mandy	PBXs, computer-telephony integration systems	Canadian company
74		Bruce Sachs	Bruce Sachs		Continuously available systems and services	
75	Robert J. Finocchio	Robert J. Finocchio	Robert J. Finocchio	Dan Hunt	DBMS, tools and connectivity	
76		Andrew Filipowski	Andrew Filipowski	Tom Slowey	Systems management, data warehousing	
77	William L. Larson	William L. Larson	Leslie G. Denend	Dennis Cline	Antivirus, fault and performance management, help desk software	McAfee/Network General merged (10/97)
78	Scott D. Cook	William V. Campbell	William V. Campbell		Finance/tax preparation software	
79			James A. Risher		Power management systems	Subsidiary, BTR Plc (Great Britain) (10/97)
80	Max P. Watson Jr.	Max P. Watson Jr.	Max P. Watson Jr.	Richard P. Gardner	Application management optimization, DBMS software	
81	Edwin I. Colodny	Betty C. Alewine	Betty C. Alewine	Joanne Tanner	Satellite/wireless audio/video/data communications	
82	Jim Clark	Jim Barksdale	Jim Barksdale	Mike Homer	Open client/server and commercial Internet applications	
83	Bob Annunziata	Bob Annunziata	Bob Annunziata		Local telecom,value-added network services	Subsidiary, AT&T (1/98)
84	Sam Wyly	Sterling L. Williams	Sterling L. Williams		Applications/systems management, federal systems	Acquired Texas Instruments Software (6/97)
85	Carl D. Carman	Gordon E. Eubanks Jr.	Gordon E. Eubanks Jr.		Remote computing, enterprise development, security	
86	Norman E. Gaut	Bruce R. Bond	Bruce R. Bond	David W. Grainger	Videoconferencing/teleconferencing equipment	
87	Raj Reddy	Frank Brick	Frank Brick	James Cleveland	Wireless mobile computers and networks	
88	John Palmer	John T. Stupka	John T. Stupka	Jack Harvey	Wireless communications, global wireless messaging	Parent of Skytel
89	Eric C. Cooper	Thomas J. Gill	Thomas J. Gill	Michael I. Green	ATM, LAN switches, WAN multiplexers, internetworking	
90	Jim Carreker	Jim Carreker	Dennis Haar	Larry Miller	ACDs, interactive response, management information/reporting	
91	John F. Reno	John F. Reno	John F. Reno		LAN/WAN switches, tech control/patching equipment	
92	Paul Richman	Paul Richman	Lance Murrah	Joseph Gurgone	PC LAN system products, semiconductors, VLSI circuits	
93		Ed Blechschmidt	Ed Blechschmidt	Erik Hansen	Scalable enterprise computing systems and servers	Subsidiary, Siemens Nixdorf AG (Ger.)
94	William L. Marriner	William L. Marriner	William L. Marriner	Mark W. Canright	Tape drives and intelligent, fully automated libraries	
95	Hans Wolf	Joseph J. Francesconi	Joseph J. Francesconi	Raymond E. Pererell	Multiservice backbone networks and services	
96	Kobi Alexander	Kobi Alexander	Kobi Alexander		Voice messaging, multimedia software	
97			Gerald D. Cohen	David Kemler	Enterprise data access, application development, data warehouse	
98	Charles S. Strauch	Charles S. Strauch	Howard Flagg	Thomas Reynolds	High-speed digital communications systems	
99		S. Shelby Bryan	S. Shelby Bryan		National competitive local exchange carrier	
100	Mark C. Smith	Mark C. Smith	Howard Thrailkill	Steve Harvey	Digital telecommunications equipment	
101		Howard Bubb	Howard Bubb	John Alfieri	Computer telephony components, voice processing	
102	Frederick D. Lawrence	Frederick D. Lawrence	Frederick D. Lawrence		Satellite earth stations, microwave radios	
103	Ted Smith	Ted Smith			Workflow, document imaging/management, software developer	
104	David C. Ruberg	David C. Ruberg	David C. Ruberg	James F. Geiger	Voice data, business Internet connectivity, Web hosting	
105	Cal Harling	Rick Soskin	Rick Soskin	Warren Pillsbury	Net management, routers, hubs, switches, front-end processors	Subsidiary, GATX Capital
106	Steve Y. Kim	Steve Y. Kim		Yuri Pikover	Network management	
107	Charles P. Johnson	Charles P. Johnson	Ross Belson	Jay Damiano	ATM switches, network access, transmission products	
108		Didier J. Delepine	Didier J. Delepine		Managed data network services, voice services	Subsidiary, SITA Telecommunications (Neth.)**
109		Bruce N. Moore	Bruce N. Moore		File servers, high-availability software	
110	Dennis C. Hayes	Ronald A. Howard	P. K. Chan		Fax boards, intelligent modems, network software	
111	Franklin P. Johnson	Paul E. Newton	Paul E. Newton	Richard Harritt	Enterprise availability management	
112		Alok Mohan	Alok Mohan		Unix system software, client/server integration software	
113		Francis E. Girard	Francis E. Girard		Voice and information processing systems	Subsidiary, Comverse Technology (1/98)
114	Dick Moeller	Dick Moeller	Jerry Benson		Interactive multimedia videoconferencing systems	
115			Joseph Alsop		Application development tools, DBMS	
116	Dirk I. Gates	Dirk I. Gates	Dirk I. Gates		PC card remote access products	
117	Carl J. Rickertsen	Daniel F. Gillis	Daniel F. Gillis	Alan M. Teicher	DBMS, data warehouse, application development, middleware	Spinoff from Software AG Systems (Ger.) (4/97)***
118	Charles D. Kissner	Charles D. Kissner	Sam Smookler	Frank Carretta Jr.	Digital microwave radios	
119	John P. Schinas	Jerry A. Dusa	Jerry A. Dusa	Michael Knudsen	Data communications hardware/software for remote access	
120	Shlomo Margalit	Noam Lotan	Noam Lotan		Computer networking, fiber-optic transmission	Acquired Xyplex (2/98)
121	Cher Wang	Peter Ow	Wen-Chi Chen	Soyen Hwang	PCs, notebooks, peripherals	Subsidiary, First International (Taiwan)
122	Delbert Yocam	Delbert Yocam	Delbert Yocam	John Floisand	Compilers, languages, DBMS/file management	
123		James L. Zucco Jr.	James L. Zucco Jr.		Remote access, internetworking products/services	
124	A. B. Edelman	A. B. Edelman	B. D. Thomas		Computer systems, network integration software	
125	James Simpson	John Wall	John Wall		Information access and data management software	
126	Charles R. Stuckey Jr.	Charles R. Stuckey Jr.	Charles R. Stuckey Jr.	Gary Rogers	Enterprisewide network security products	
127		Bob Gilbertson	Bob Gilbertson	Cecil Dye	Network computing products	
128	Larry Garlick	Larry Garlick	Larry Garlick	Dave Mahler	Help desk software	
129	Jean-Claude Asscher	Michael L. Margolis	Michael L. Margolis		Diagnostic and testing equipment, network switches	
130	Ed Iacobucci	Roger Roberts	Mark Templeton	Michael Passaro	Thin-client/server computing software	
131	William L. Schrader	William L. Schrader	William L. Schrader	Jack Chidester	LAN remote access, Web hosting/security/intranet	
132		William B. Smith	William B. Smith		Broadband, loop access, LAN interconnect, wireless	
133	Par Chadha	Par Chadha	Xin Cheng	Arthur Trakas	LAN, WAN, broadband, internetworking, print servers	
134		Peter Brojde	Peter Brojde	Kenneth Gingrich	Desktop/server integration, information access solutions	Subsidiary, Eicon (Can.)

1997 Revenue Rank	1996 Revenue Rank	Company	1997 Revenue $M	'96-'97 %Δ	'92-'97 CAGR	Int'l %	1997 Profits $M	'96-'97 %Δ	'92-'97 CAGR	Profit Rank	Mkt. Cap. $M 3/20/98	Stock Symbol	Number of Employees 1997	'96-'97 %Δ	'92-'97 CAGR	R&D % Rev. 1996	% Rev. 1997	Year Inc.	Fiscal Year Ends	Web Address
135	141	**Procom Technology**	109	49%	21%		8.4	200%	70%	85	95	PRCM	246			3%	4%	1987	7/31	procom
136	129	**Centigram Communications**	109	5%	19%						90	CGRM	418			19%	20%	1980	10/31	centigram
137	140	**Hummingbird Comm.**	101	35%			28.1	62%		70	482	HUMCF				11%	12%	1984	9/30	hummingbird
138	133	**Computer Network Tech.**	98	1%	23%	28%	(2.3)			120	97	CMNT	629	26%	42%	14%	18%	1983	12/31	cnt
139	122	**Optical Data Systems**	92	-22%	13%	27%	(4.9)			122	99	ODSI	400	0%		9%	12%	1983	12/31	ods
140	117	**Global Village Comm.**	90	-34%			(39.9)			153	43	GVIL				11%	13%	1989	3/31	globalvillage
141	118	**Quarterdeck**	84	-37%		22%	(18.4)			141	88	QDEK	315	-48%	1%			1982	9/30	quarterdeck
142	144	**Asante Technologies**	83	24%	12%	18%	1.9			103	32	ASNT	190	-4%		9%	9%	1988	9/30	asante
143	174	**CheckPoint Software**	83	159%		45%	40.2	164%		62	1,490	CHKPF	300	150%		9%	7%	1993	12/31	checkpoint
144	157	**CYLINK**	81	55%			(58.8)			162	373	CYLK				22%	21%	1984	12/31	cylink
145	143	**WinStar**	80	17%			(249.5)			174	1,430	WCII	1,300	30%				1990	12/31	winstar
146	152	**Davox**	77	43%			18.4	102%		78	400	DAVX				11%	11%	1987	12/31	davox
147	145	**Larscom**	76	15%	18%						159	LARS	258	8%	11%			1970	12/31	larscom
148	161	**Documentum**	76	67%	-31%		7.4	64%		87	781	DCTM	360	25%	97%	17%	15%	1990	12/31	documentum
149	126	**Banyan Systems**	74	-29%	-8%	29%	(16.9)			140	82	BNYN	410	-37%	-9%	21%	21%	1983	12/31	banyan
150	150	**Brooktrout Technology**	72	24%	42%						177	BRKT	200	27%	22%			1984	12/31	brooktrout
151	114	**Boca Research**	70	-54%	10%	21%	(14.9)			136	51	BOCI	240			2%	4%	1985	12/31	bocaresearch
152	170	**AXENT Technologies**	70	91%		22%	(18.6)			142	318	AXNT	396	30%		22%	18%	1994	12/31	axent
153	131	**FTP Software**	68	-33%			(56.6)			160	104	FTPS				64%	40%	1986	12/31	ftp
154	184	**Yahoo**	67	238%			(22.9)			145	3,810	YHOO				26%	17%	1995	12/31	yahoo
155	123	**Gandalf Systems**	66	-43%	-11%		(46.3)			156	0	GANDF	615	-24%		10%	20%	1970	3/31	gandalf.ca
156	155	**Digital Link**	66	27%	31%	17%	1.9	-60%	0%	104	101	DLNK	281	27%	22%	19%	17%	1985	12/31	dl
157	151	**Interphase**	66	16%	8%		(1.0)			116	43	INPH	250					1977	12/31	iphase
158	137	**Interleaf**	65	-27%	-8%	40%	(29.6)			148	59	LEAF	342			18%	23%	1981	3/31	interleaf
159	158	**Emulex**	65	26%	-9%	45%	1.6			105	70	EMLX	332	-5%	-11%	22%	15%	1979	6/30	emulex
160	132	**Zoom Telephonics**	64	-36%	9%	22%	(7.1)			126	67	ZOOM	320	7%	32%	3%	7%	1977	12/31	zoomtel
161	154	**Transaction Network**	63	21%	74%	2%	7.4	28%		86	207	TNSI	125	14%	38%	5%	5%	1990	12/31	tnsi
162	128	**NetManage**	62	-41%			(33.8)			151	154	NETM						1990	12/31	netmanage
163	182	**Open Market**	61	172%			(58.0)			161	572	OMKT	500	43%		73%	56%	1994	12/31	openmarket
164	193	**American Communications**	59	556%			(76.5)			163	691	ACNS	800					1993	6/30	acsi.net
165	146	**Centura Software**	58	-8%	12%	60%	(0.6)			114	28	CNTR	180	-33%	-13%	17%	17%	1984	12/31	centurasoft
166	164	**Applied Voice Tech.**	58	31%		21%					216	AVTC	285	63%		9%	7%	1982	12/31	appliedvoice
167	167	**Verilink**	57	37%			4.2	54%		92	138	VRLK				18%	16%	1982	6/30	verilink
168	173	**Edify**	57	73%	104%		4.0			93	308	EDFY	350	40%		18%	18%	1990	12/31	edify
169	159	**PC DOCS**	55	8%	35%	9%	1.1	-82%		107	107	DOCSF	472	22%		16%	26%	1986	6/30	pcdocs
170	149	**Wandel & Goltermann Tech.**	55	-8%			0.4			109	81	WGTI	275	0%	7%		20%	1966	9/30	wg
171	166	**XcelleNet**	54	26%			3.1	NM		98	169	XNET						1986	12/31	xcellenet
172	186	**MindSpring Enterprises**	53	190%			(4.1)			121	487	MSPG	502	56%				1994	12/31	mindspring
173	147	**Netopia**	52	-15%		29%	(0.5)			113	64	NTPA	244	20%		14%	17%	1986	9/30	netopia
174	188	**Excite**	50	239%			(30.2)			149	781	XCIT	200	208%				1995	12/31	excite
175		**Graphnet**	50			40%	0.0			112	N/A	Private	200				4%	1987	7/31	graphnet
176	169	**D-Link Systems**	50	25%	38%	10%					N/A	Private	106	104%	29%	10%	10%	1986	12/31	dlink
177	178	**ACT Networks**	49	73%		75%	1.5			106	111	ANET	250			18%	17%	1987	6/30	acti
178	187	**Concentric Network**	45	190%			(55.6)			159	266	CNCX	425	42%		16%	11%	1991	12/31	concentric
179	168	**Proxim**	43	4%			0.1	-98%		111	155	PROX				12%	20%	1984	12/31	proxim
180	156	**ON Technology**	41	-21%			(7.1)			127	19	ONTC						1985	12/31	on
181	160	**Apertus Technologies**	37	-25%	10%		(14.5)			135	19	APTS				27%	26%	1979	3/31	apertus
182	172	**Memotec Communications**	35	4%			8.7	-2%		84	N/A	N/A	202	-19%		16%	13%	1994	12/31	memotec
183	181	**Peregrine Systems**	35	47%			5.8			90	N/A	Private	180			33%	17%	1980	3/31	peregrine
184	153	**Network Peripherals**	35	-34%	37%	26%	(22.4)			144	92	NPIX	152	-36%	25%	16%	28%	1989	12/31	npix
185		**Infoseek**	35								558	SEEK	185					1994	12/31	infoseek
186	148	**Artisoft**	33	-45%	-15%	27%	(2.0)			119	43	ASFT	270	-26%	-10%	12%	28%	1982	6/30	artisoft
187	165	**Netrix**	33	-24%			(8.6)			131	18	NTRX				25%	25%	1985	12/31	netrix
188	189	**RealNetworks**	33	134%			(11.2)			133	556	RNWK						1994	12/31	real
189	180	**Microlog**	32	24%	10%	9%	3.7	37%		95	22	MLOG	300	12%	4%	12%	11%	1969	10/31	mlog
190	175	**SEEQ Technology**	31	0%	-3%	32%	5.0	67%		91	93	SEEQ	70	0%	-18%	10%	10%	1981	9/30	seeq
191	183	**Voicetek**	29	32%	54%	17%	(1.9)			118	N/A	Private	200	25%	38%	26%	26%	1981	12/31	voicetek
192		**PlainTree Systems**	29								47	LANPF	157					1988	3/31	plaintree
193	179	**Equinox Systems**	28	10%	6%	20%	3.9	42%	9%	94	72	EQNX	95	-1%	1%	10%	10%	1983	12/31	equinox
194	192	**Broadvision**	27	145%		44%	(7.4)			129	333	BVSN	225	52%		45%	26%	1993	12/31	broadvision
195	162	**Proteon**	27	-41%			(7.8)			130	21	PTON				21%	22%	1972	12/31	proteon
196	191	**First Virtual**	26	100%		27%					N/A	Private	68	51%		31%	19%	1993		fvc
197	177	**Castelle**	25	-17%	6%	48%	(6.9)			125	11	CSTL	103	-16%	1%	8%	12%	1987	12/31	castelle
198	185	**Interlink Computer Sciences**	25	27%		64%	3.4			96	43	INLK	192			27%	31%	1985	6/30	interlink
199	190	**SBE**	25	87%			3.3			97	20	SBEI				38%	11%	1961	10/31	sbei
200	176	**UNIFY**	24	-20%			(0.9)			115	17	UNFY				19%	29%	1980	4/30	unify

Footnotes: NM – Not measurable *Compound annual growth rate **U.S.-based operations only ***Americas market

1997 Revenue Rank	Chair	CEO	President	Sales	Products and Services	Notes
135	Alex Razmjoo	Alex Razmjoo	Alex Razmjoo		CD arrays, CD digital linear tape and DLT	
136	Dean O. Morton	Robert L. Puette	Robert L. Puette		Voice, fax, data and e-mail messaging	
137	Fred Sorkin	Fred Sorkin	Fred Sorkin	Howard Wallace	Enterprise software, document distribution solutions	Canadian company
138	John A. Rollwagen	Tom Hudson	Tom Hudson	Tom Hudson	Data center/storage networking, channel extension	
139	Ward Paxton	Ward Paxton	Ward Paxton	Joe Howard	Intelligent switches, routers, bridges, network management	
140	Leonard A. Lehmann	Neil Selvin	Neil Selvin		Fax modems and servers, Internet access servers	
141	Frank LaHaye	Curtis A. Hessler	Curtis A. Hessler	Joseph Fusco	Utilities and communications software	
142	Jeff Lin	Jeff Lin	Jeff Lin	Paul Smith	Hubs, switches, NICs, network management/acceleration	
143	Gil Shwed	Gil Shwed	Deborah Triant	John Cunningham	Enterprise security and bandwidth management	
144		Fernand B Sarrat	Fernand B Sarrat	Tom Butler	Enterprise information security, wireless telecom	
145	William J. Rouhana Jr.	William J. Rouhana Jr.	Nathan Kantor		Local and long-distance telecom, Internet access	
146	Alphonse Lucchese	Alphonse Lucchese	Louis Marianacci		Unified call center products	
147	Paul Graf	Deborah Soon	Deborah Soon	George Donohoe	High-speed WAN access equipment	Subsidiary, Axel Johnson
148	Robert Adams	Jeffrey A. Miller	Jeffrey A. Miller	Paul Hoffman	Enterprise document management software	
149	William P. Ferry	William P. Ferry	William P. Ferry	Bob Burke	Enterprise directory technology/services	
150		Eric Giler	Eric Giler	Michael Donoghue	Software, PC boards, fax boards	
151	Robert W. Ferguson	Anthony F. Zalenski	Anthony F. Zalenski		PC controller boards	
152	Richard A. Lefebvre	John C. Becker	John C. Becker	Brett M. Jackson	Enterprisewide information security	
153	Glen C. Hazard	Glen C. Hazard			Internet software, remote access	
154	Jerry Yang	Tim Koogle	Tim Koogle	Anil Singh	Global Internet media company	
155	John F. Gamba	Richard Busto	Richard Busto		Remote access and internetworking solutions	Subsidiary, Mitel (Can.)
156	Vinita Gupta	Alan Fraser	Alan Fraser	Jack Musgrove	Data communications access products for public and private WANs	
157	Stephen Polley	Stephen Polley	Stephen Polley	Don Maulsby	ATM and FDDI adapters	
158	Rory J. Cowan	Jaime Ellertson	Jaime Ellertson	Gary R. Phillips	Document management publishing, consulting	
159	Fred B. Cox	Paul F. Folino	Paul F. Folino	Michael A. Peitler	Printer/remote access servers, routers, host adapters	
160	Frank Manning	Frank Manning	Frank Manning	Terry Manning	Fax modems, routers, digital cameras, dialers	
161		John J. McDonnell Jr.	John J. McDonnell Jr.	Brian Bates	Data communications networks, transport services	
162		Zvi Alon	Zvi Alon	Jay Klein	TCP/IP protocol stacks, terminal emulation software	
163	Shikar Ghosh	Gary Eichhorn	Gary Eichhorn	Dan Ross	Internet commerce, information management	
164	Tony Pompliano	Jack Reich	Jack Reich		Competitive local exchange carrier	
165	Scott Broomfield	Scott Broomfield	Scott Broomfield		Web and client/server application development tools	Formerly Gupta
166		Richard J. LaPorte	Richard J. LaPorte	Tim A. Wudi	Call processing, messaging, computer-telephony integration	
167		Leigh S. Belden	Leigh S. Belden	Robert F Griffith	Integrated access devices, T-1/E-1 multiplexers, DSUs/CSUs	
168		Jeffrey M. Crowe	Jeffrey M. Crowe	Jeffrey M. Crowe	Self-service software products via the Internet, intranets	
169	Rubin I. Osten	Rubin I. Osten	Rubin I. Osten		Enterprise document/information management	Canadian company
170	Peter Wagner	Peter Wagner	Peter Wagner		Electronic test and measurement equipment	Division of Wandel & Golterman (Ger.)**
171	Dennis M. Crumpler	Dennis M. Crumpler	Corey M. Smith	Jethro J. Felton III	Remote access utility software	
172	Charles Brewer	Charles Brewer	Michael McQuary	Alan Taetle	Internet access services and Web hosting	
173	Reese Jones	Alan Lefkof	Alan Lefkof	Tom Skoris	Internet connectivity, collaborative software, LAN products	Formerly Farallon Computing
174		George Bell	George Bell	Ken Wachtel	Web search and retrieval services	
175		Yaakov Elkon	Yaakov Elkon	Steve Wasserman	Packet switching	
176	Ken Kao	Roger Kao	Roger Kao	Steven H. Joe	Modems and multiplexers	Subsidiary, D-Link (Taiwan)**
177	Martin Shum	Martin Shum	Martin Shum	Linda Carlson	Voice over frame relay, WAN access products	
178	Henry R. Nothhaft	Henry R. Nothhaft	Henry R. Nothhaft	William Etheredge	Virtual private networks, IP videoconferencing	
179	David King	David King	David King	Brian Button	Spread spectrum radio network products	
180		Herman DeLatte	Herman DeLatte		Enterprise client management software	
181	Robert D. Gordon	Robert D. Gordon	Robert D. Gordon		Software for integrating computer environments	
182	Richard Drouin	Henry Epstein	Henry Epstein	Anthony Wiley	Network products, integrated WAN solutions	Canadian company
183		Alan H. Hunt	Alan H. Hunt		Enterprise service desk software	
184	Glenn Penisten	Pauline Lo Alker	Pauline Lo Alker	James Sullivan	NICs, Ethernet and Fast Ethernet switches	
185	Steven T. Kirsch	Harry M. Motro	Beth Haggerty		Internet navigation	
186	Jerry E. Goldress	Jerry E. Goldress	T. Paul Thomas	Rick L. McGee	Remote communications, computer telephony	
187		Lynn Chapman	Lynn Chapman		WAN switching	
188	Rob Glaser	Rob Glaser	Bruce Jacobsen	Len Jordan	Real-time media over the Internet	
189		Richard A. Thompson	Richard A. Thompson	Steven R. Delmar	Call center integration, Web integration	
190	Alan Gregory	Phil Salsbury	Phil Salsbury	Robert Frostholm	Data communications semiconductor products	
191	Sheldon Dinkes	Sheldon Dinkes	Sheldon Dinkes	James Buggie	Development/deployment platform for call centers	
192	David Delaney	Bruce V. Walter	Bruce V. Walter	Alan D. Greenfield	LAN switching products	Canadian company
193	William A. Dambrackas	William A. Dambrackas	William A. Dambrackas	Thomas E. Garrett	Serial I/O products, terminal servers, data switches	
194	Pehong Chen	Pehong Chen	Pehong Chen		Online relationship management enterprise software	
195	Howard C. Salwen	Daniel J. Capone	Daniel J. Capone	Kenneth W. Hovaldt	Remote access routers	
196	Ralph Ungermann	Ralph Ungermann	Ralph Ungermann	Alan Mc Millan	Video networking	
197	Arthur H. Bruno	Roy V. Prasad	Roy V. Prasad	Jerry Burke	Print/fax servers, e-mail gateways	
198		A. J. Berkeley	A. J. Berkeley		Network transport products, systems management	
199		William B. Heye Jr.	William B. Heye Jr.	Michael R. Coker	Remote access for high-end systems	
200	Reza Mikailli	Reza Mikailli	Reza Mikailli	Richard Medeiros	Client/server development, relational DBMS,4GL	

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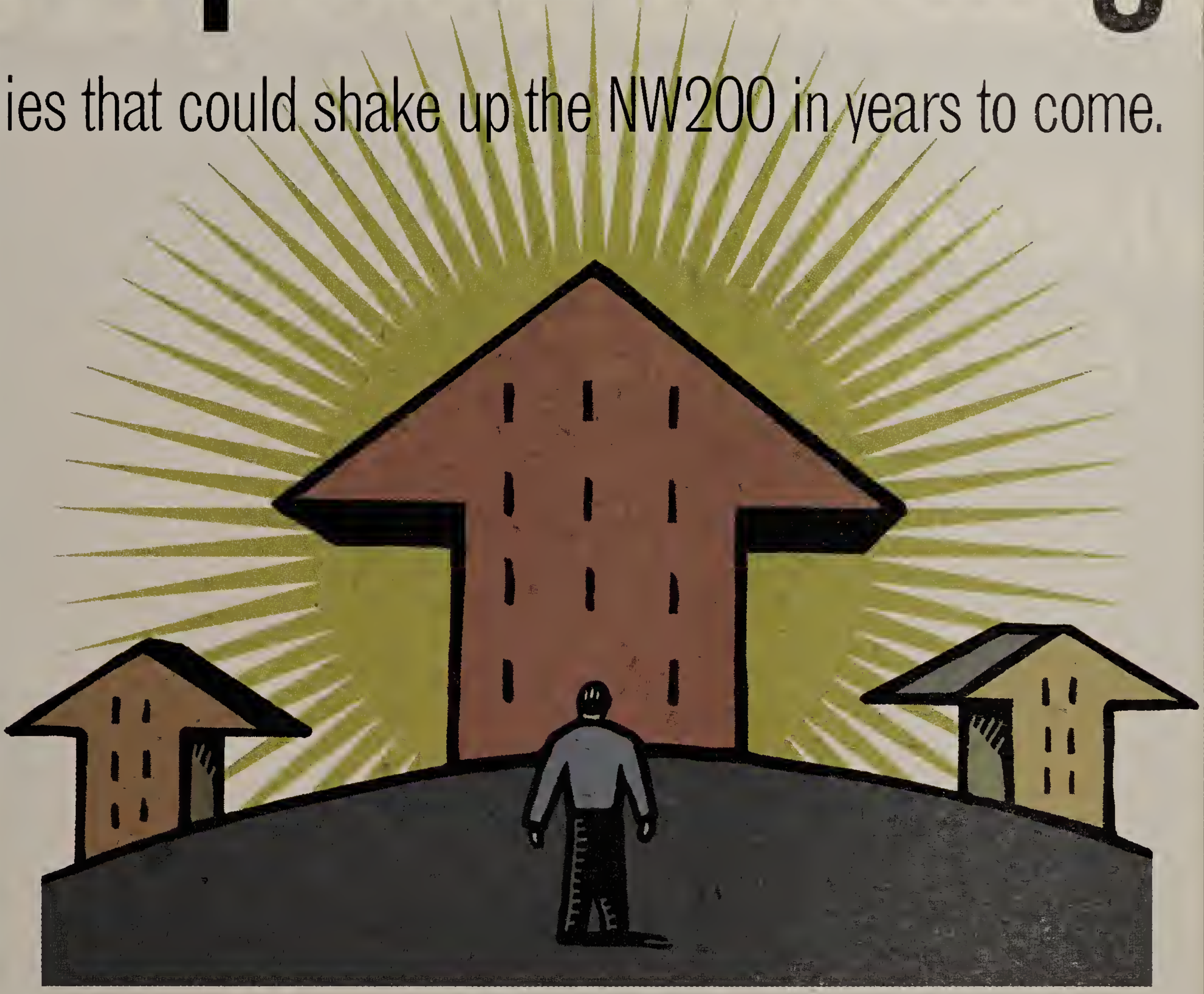
The Up and Coming

Get to know five companies that could shake up the NW200 in years to come.

By Chris Nerney

Making the Network World 200 isn't easy. Dozens of companies just missed a spot on our exclusive list. Some are established firms that already have success stories to tell, while others are start-ups working toward potentially bright futures.

We've chosen five such companies to profile. Four of them are public, one private. Their markets range from security to online content to embedded software. What they share is a willingness to identify and quickly adapt to technology trends. Here are some of the companies just over the Network World 200 horizon.



Lycos searches for an audience

Lycos, Inc. is in the eyeball game.

"Our sole focus is audience size," says Robert Davis, CEO of the 3-year-old online information provider. "Anyplace there are consumers, there are advertisers."

So far Lycos has been pretty successful in drawing an audience — or "eyeballs," in industry parlance — for those advertisers. The company estimates its Web site averages more than 10 million visitors each day.

With the recent purchase of Tripod, Inc., creator of a popular consumer Web site targeted at the lucrative Generation-X market, Lycos' network of Web sites now ranks fifth worldwide in attracting visitors, trailing only America Online, Inc., Yahoo, Inc., Microsoft Corp. and Netscape Communications Corp.

The recipe Lycos uses to draw audiences is similar to that used by Yahoo, InfoSeek Corp. and other online content aggregators. The company provides Web users easy access to organized information on a wide range of topics — including personal finances, travel, sports and the weather. Along with the information visitors download are banner ads sold by Lycos.

The ability to drive and capture Web traffic has made Lycos one of the few profitable companies today among those relying on Internet advertising for its chief source of revenue.

After five consecutive quarters of losses since going public in April 1996, Lycos has posted profits — albeit modest ones — for the past two quarters. Its stock is trading at an all-time high of more than $60 per share.

The company was founded in June 1995 to sell search engine technology developed at Carnegie Mellon University. Like Yahoo, InfoSeek and Excite, Inc., all of which began as search engines, Lycos quickly diversified its Web site offerings in order to tap into the growing online advertising market.

LYCOS, INC.

Location: **Waltham, Mass.**
CEO/President: **Robert Davis**
Number of employees (1997): **122**
Year incorporated: **1995**
Web address: **www.lycos.com**
Products/services: **Online information service geared toward consumers; started as a search engine**
Revenue model: **Selling online advertising space on its Web site**
Stock symbol: **LCOS**
Market capitalization: **$697 million**

Concord leads in network analysis tools market

If there's one thing network managers and chief information officers can't get enough of, it's information on how their networks are running.

So it's no surprise that the market for network performance and analysis software is expected to grow from $50 million in 1996 to $700 million by 2000, according to META Group, Inc.

Today, the undisputed leader of that market is a 12-year-old company that originally sold hardware monitoring devices for manufacturing automation.

Concord Communications, Inc.'s journey from hardware hawker to Web-based software vendor has a common thread: the company's evolving expertise in network management.

In 1989, three years after its launch as a maker of hardware probes, Concord began developing network management software. By 1992, almost all of the company's revenue came from Trakker, a LAN monitoring tool.

Two years later, the company reorganized. Jack Blaeser, a venture capitalist and Concord board member, was named president and CEO. Blaeser and a new management team saw a great vehicle to expand the markets for Concord's network analysis tools — the Internet.

By the end of 1995, Concord began shipping Network Health, a Web-based, software-only per-

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By the end of 1995, Concord began shipping Network Health, a Web-based, software-only performance and analysis product.

Concord now offers four different products under the Network Health name. Three are designed to monitor and report on specific parts of the network: LAN/WAN and frame relay; routers and switches; and servers. The fourth product, Traffic Accountant, provides information on network usage patterns.

More than 75% of Concord's revenue comes from the LAN/WAN and router/switch products.

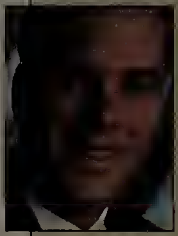
Concord has more than 500 customers for its products. In March alone, it added megacorporations such as BankBoston, MasterCard, Xerox, Staples and Disney.

Last year was Concord's best yet. Besides more than doubling earnings over 1996 to nearly $20 million, the company launched a successful initial public offering in October, raising $41 million. Concord's stock has been trading at twice the offer price of $14.

Change is embedded at Spyglass

Today, Spyglass, Inc. sells embedded software that allows non-PC consumer devices to access the Internet. But President and CEO Douglas Colbeth can't say for sure what his company will be doing once the next millennium begins. And that's fine with him.

SPYGLASS, INC.



Location: **Naperville, Ill.**

CEO/President: **Douglas Colbeth**

Number of employees (1997): **162**

Year incorporated: **1990**

Web address: **www.spyglass.com**

Products/services: **Embedded software for non-PC devices that access the Internet**

Revenue model: **Software sales and service contracts**

Stock symbol: **SPYG**

Market capitalization: **$105 million**

"To survive in our business you have to be willing to reinvent yourself every three years," he says.

Founded in 1990, Spyglass has pretty much kept pace with Colbeth's law of high-tech survival. The company began by selling 3-D modeling software to scientists for medical, geological and geographical research.

Spyglass came up with some great technology, but the market wasn't ready for it. And the government research funds that fueled sales

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sex scandals... planetary probes...
and other unproductive Internet nasties are invading your network.

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were declining.

Along came the Internet, and with it Spyglass' second incarnation, for which it is best-known. In 1994, Spyglass was granted a license by the University of Illinois — where several Spyglass engineers were students — to develop a commercial version of Mosaic, the first Web browser.

It appeared that Spyglass had struck gold with Mosaic. Microsoft Corp. paid the company $2 million in late 1994 for the rights to include Mosaic technology in its Windows 95 operating system.

Dozens of other vendors licensed Spyglass technology, and by the end of 1995, the company was pulling down $20 million annually in licensing revenue alone.

Then Microsoft announced it would begin giving away its Mosaic-based browser, Internet Explorer. While Spyglass earned licensing fees for every browser Microsoft gave away, the start-up lost much more revenue from direct customers stampeding toward the freebie.

Enter Phase III of the Spyglass story.

Recognizing that the Internet's reach would soon extend beyond the desktop, Spyglass in late 1996 refocused its strategy, developing a line of browser software to Web-enable consumer devices such as set-top boxes and TVs, cellular phones, personal digital assistants and office equipment. It also began offering consulting services to device manufacturers.

The transition has not been painless. Spyglass sustained almost $10 million in losses during its last fiscal year and doesn't expect to make a profit until next year.

ISS products go looking for trouble

Back in 1994, when Internet Security Systems, Inc. (ISS) was formed, protecting your network essentially meant implementing a password system or, if you were really cutting edge, installing a firewall.

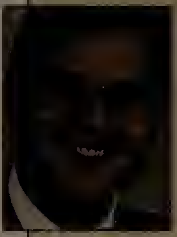
But with the brave new world of the Internet and electronic commerce on the horizon, ISS founder Christopher Klaus didn't think the answer to a company's security concerns was to build a moat around its network.

Besides, it didn't make much sense to join the more than 50 firewall vendors fighting for one piece of the security market.

So Klaus decided to base the first ISS product on a research project he had developed as a student at the Georgia Institute of Technology.

That product, Internet Scanner, in essence serves as a network's night watchman, continuously making its rounds by automatically searching for vulnerabilities, detecting security breaches and, if necessary, taking

INTERNET SECURITY SYSTEMS, INC.



Location: **Atlanta**

CEO/President: **Thomas Noonan**

Number of employees (1997): **150**

Year incorporated: **1994**

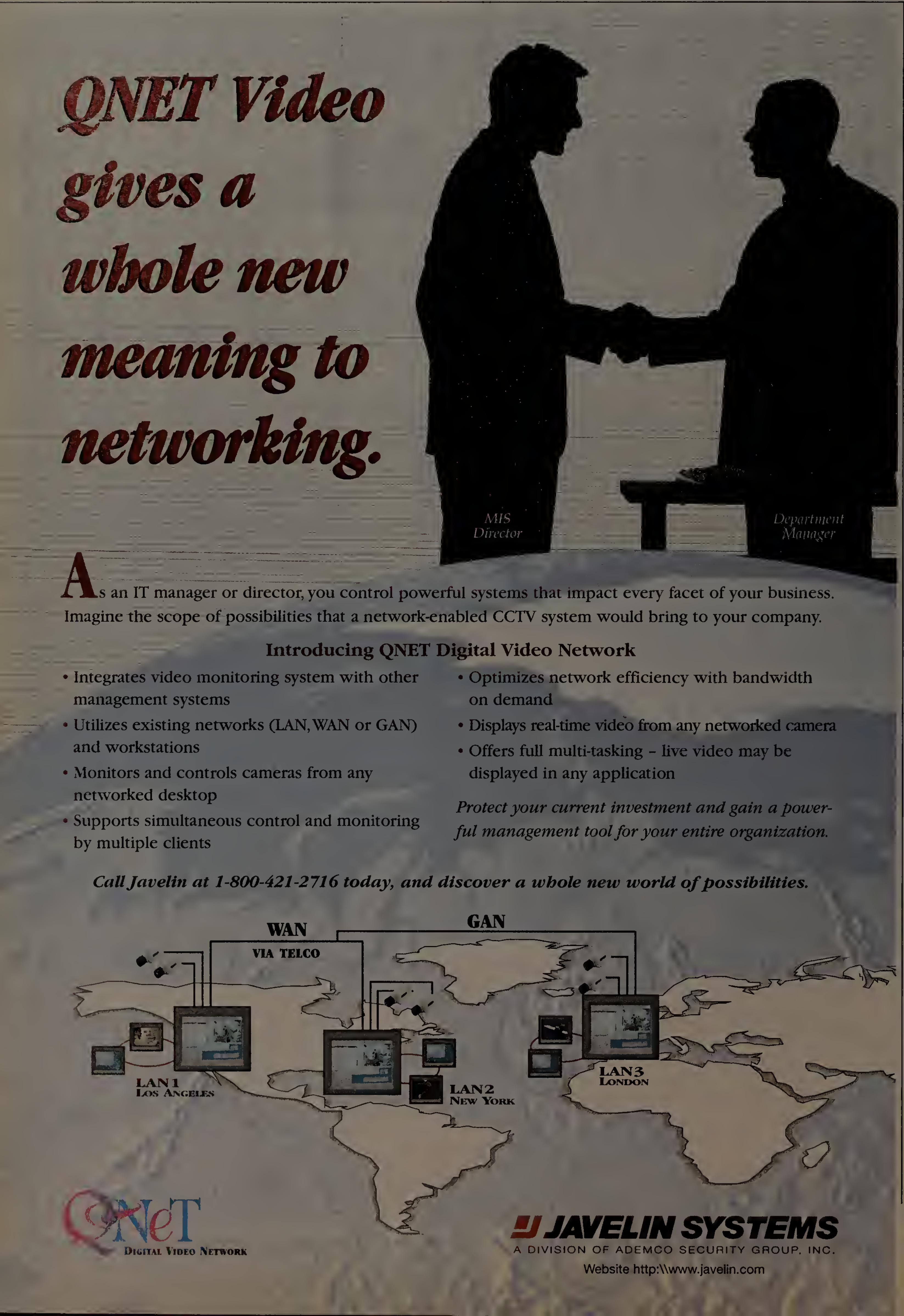
Web address: **www.iss.net**

Products/services: **Network security software**

Revenue model: **Software sales**

Stock symbol: **ISSX**

Market capitalization: **$401 million**



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action to eliminate security holes.

ISS President and CEO Thomas Noonan calls this continuous process Adaptive Security Management, and it is the basis for the company's SAFEsuite line of software, which includes Internet Scanner.

"The only way to effectively manage risk is to develop automated functions that work across the network and across each device," Noonan says.

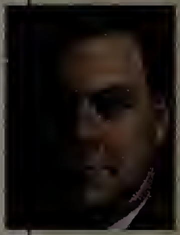
With more than 2,000 paying customers, ISS revenue has grown from $257,000 in 1995 to $13.5 million last year. The company is the market leader in intrusion detection software.

ISS was greeted with open arms by Wall Street when it launched an initial public offering (IPO) on March 24. Its holding company, ISS Group, Inc., raised $66 million in the IPO. In less than a month, the price of ISS shares has risen to twice the $22 per share offer price.

OpenConnect wants to Web-enable your network

The idea behind networking is simple: You link different computer systems, enabling them to interact, and you have a network.

OPENCONNECT SYSTEMS, INC.



Location: **Dallas**

CEO/President: **Steve Clark**

No. of employees (1997): **129**

Year incorporated: **1983**

Web address: **www.oc.com**

Products/services: **Software for Web-enabling host applications**

Revenue model: **Software sales**

Stock symbol: **Private**

Market capitalization: **N/A**

Reality, of course, is much different. For years one of the biggest challenges facing any network manager has been integrating legacy environments with open systems.

Throw the Internet into the mix and the challenge of network integration becomes colossal, and the opportunities enormous.

Network integration is the market OpenConnect Systems, Inc. has targeted. Founded in 1983, the private company provides customers with the tools and services they need to connect diverse systems.

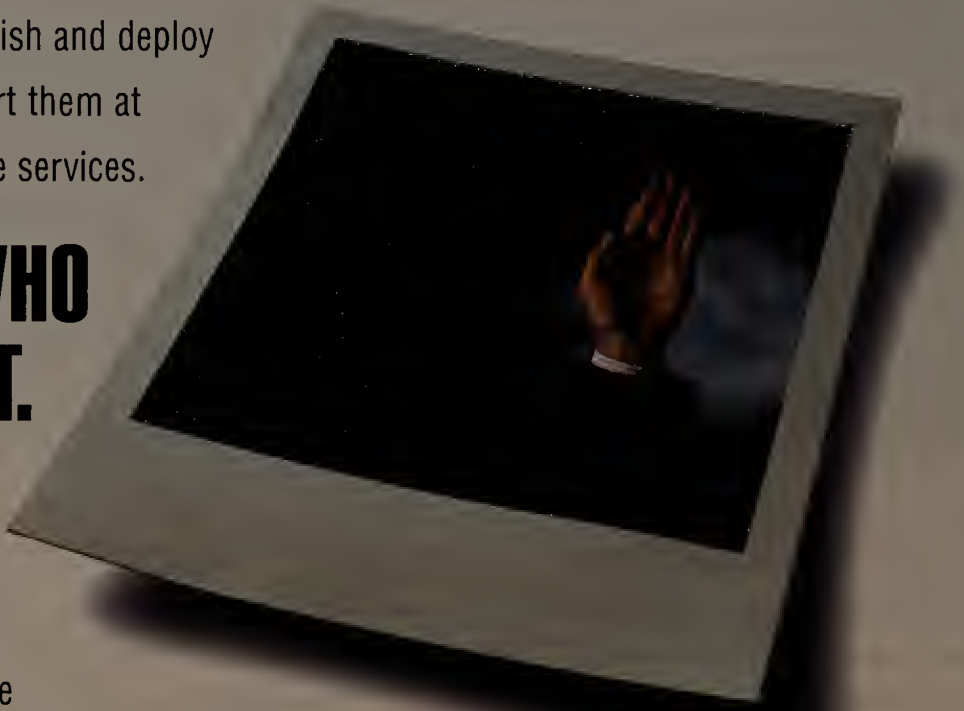
The company's products handle such unglamorous but vital chores as protocol conversion, file transfer, printing, terminal emulation and interprogram communications.

OpenConnect's specialty is providing Web-based access to host applications. The company's WebConnect products, featuring a Java-based browser, now own about a 50% share of the Web-enabling market, according to President and CEO Steve Clark.

While OpenConnect has had little trouble attracting large customers, including 40 of the Fortune 50, profits recently have become elusive.

After eking out $1.8 million in profits in 1996, the company lost $13.4 million in 1997 and cut its work force by 20%.

"The market was slow to take off last year because of year 2000 and other technology issues," Clark says. "Many of those issues are behind us now." ■



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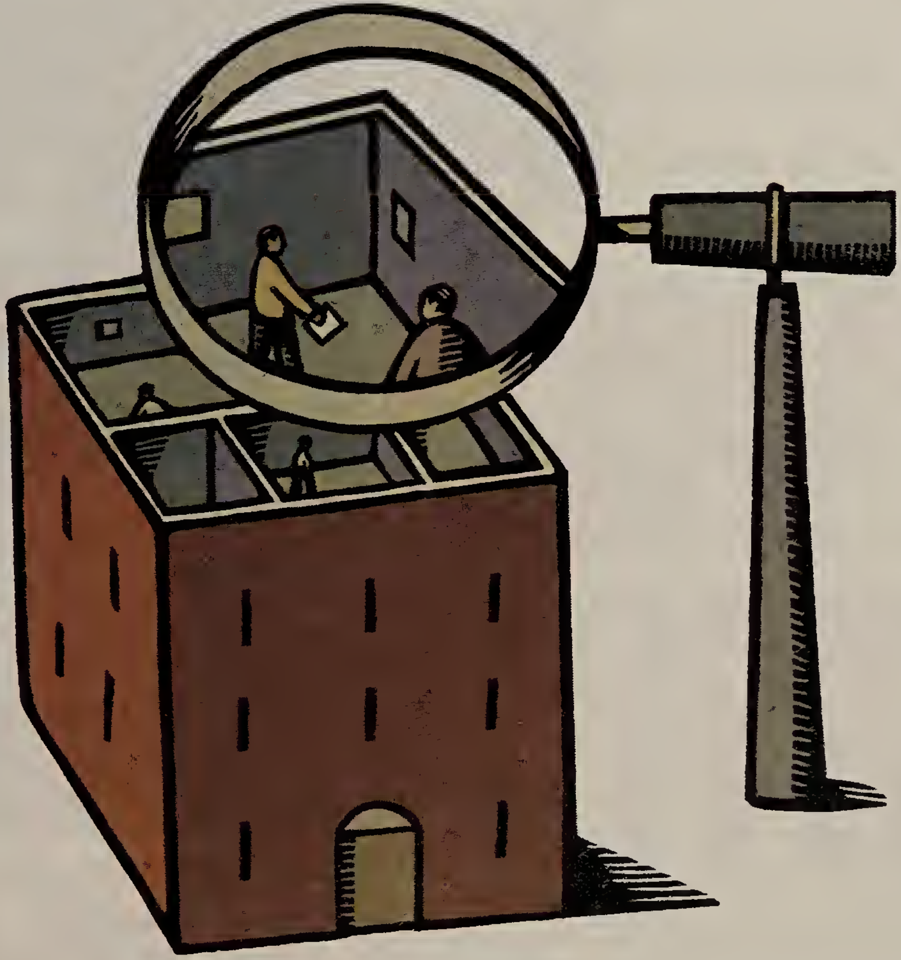
The Stalwarts

The spotlight shines on five of today's market leaders.

Companies in trouble and some that are just starting up have no trouble making headlines.



Everyone wants to know what's new. But solid name-brand outfits have plenty going on, as well. With that in mind, *Network World* analyzed five companies that long ago became household names. We wanted to see what critical issues these companies were facing, and how they planned to confront them.

All have learned the lessons of history — that it's not enough to be big or well-known. You also have to be good and, in some cases, lucky. Being in the net business just makes it all that much harder, and more intense.

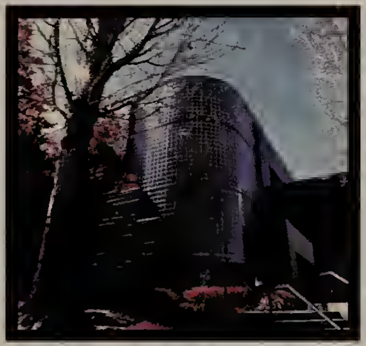
So each of the five companies has a strategy crafted by market pressure and in some cases, actual crisis. Each also has a dynamic leader whose very reputation depends on making the strategy work.

Only time will tell if these leaders will succeed. But our special reports at least give a clue as to where to place your bets.

CABLETRON

For seven months Cabletron had a new leader in Don Reed, who established a new culture, did a couple of new acquisitions and came up with a whole new strategy. Now that co-founder Craig Benson has taken the reins, what will become of the new Cabletron Reed tried to build?

Page 64



NETSCAPE

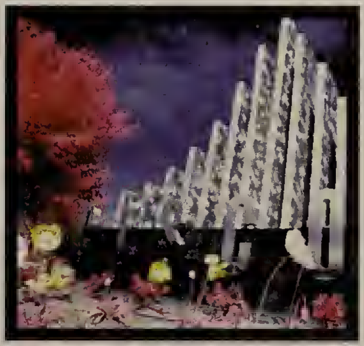
Netscape was doing great until it raised the ire and attention of Microsoft. First Microsoft bit off a big piece of Netscape's browser base with its Explorer giveaway. Then the Redmond giant took aim at server software. Can Netscape regain its original luster and market share?

Page 66

3COM

Avis was happy being No. 2. But for 3Com, that ranking is not enough, and the company sees the move to real-time data transfer as the key to a larger, brighter future. But bypassing an ever-broader and much larger Cisco could be an impossible dream.

Page 68 - 69



CISCO

As the No. 1 company in the net business, Cisco has everyone gunning for it. According to our report, Cisco is building a product line that reaches into every nook of a network manager's needs. As long as it keeps playing its cards right, Cisco should remain king of the hill.

Page 72

AT&T

Stodgy old AT&T is getting aggressive, and it couldn't happen a moment too soon. Can new CEO Mike Armstrong muscle his company into the future by meeting current and future customer demands?

Yes – if he can get the rest of the company to fall in line behind his new view.

Page 74 - 76

Cabletron changes stripes

New CEO Benson once again going his own way.

By Robin Schreier Hohman

Cabletron Systems, Inc.'s newly anointed CEO, Craig Benson, is on a mission to convince the world that he really does back the changes former CEO Don Reed brought about during his eight months at the helm.

Benson said he's going to continue Reed's most important strategies, which include an aggressive acquisition plan and a deeper commitment to the channel.

But Benson has a few ideas of his own, including a greater focus on switching and network management, and the development or acquisition of lower priced products. The Cabletron CEO also pledged to make his firm No. 1 in customer and employee satisfaction.

Benson, one of Cabletron's co-founders, has some financial rebuilding to do, as well. When Reed suddenly resigned from Cabletron at the beginning of April, and Benson took over, the company's stock price had already been falling for months, and the company had reported its first-ever quarterly loss.

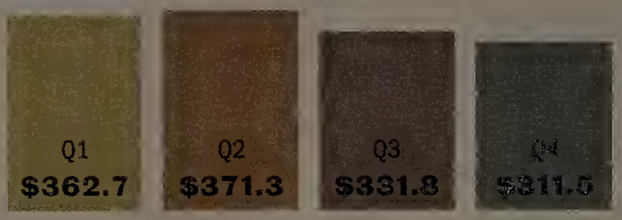
Even though Cabletron customers are said to be fiercely loyal, the company has had difficulty expanding its annual revenue beyond $1.5 billion. In most businesses, that would be considered fantastic. In the network business, however, that's not good enough.

Cabletron lags substantially behind Cisco Systems, Inc., which listed $7.3 billion in revenue, and 3Com Corp., which ran up $5.6 billion in revenue, last year. Even Bay Networks, Inc., which has had trouble in the past few years, has managed to get its act together and took in $2.3 billion last year. In 1997, Cabletron reported revenue of $1.41 billion. Fortunately, Cabletron is sitting on a wad of cash, having some half billion dollars available as a cushion or to buy its way into new markets.

SCOTT PARKER

CABLETRON FACTS

Cabletron revenue fiscal 1998*
(in millions)



Employees: **7,000**

Headquarters: **Rochester, N.H.**

1998
Acquisitions: **Digital Network Products Business. Completed Feb. 9, 1998. $430 million in cash and product credits. Main product: Channels and support.**

YAGO Systems. For 6.1 million shares of Cabletron common stock. Main product: Scalable, multilayer switching routers for high-speed Ethernet.

Major changes
in 1997: **CEO Don Levine replaced by Don Reed, former CEO of NYNEX. Cabletron broke into three divisions: Enterprise Business Unit, Service Provider Business Unit, Software Business Unit.**

Fiscal revenue **1997: $1.41 billion** **1998: $1.38 billion**

*Fiscal year ended Feb. 28, 1998

Most analysts agree on the reason the company hasn't caught up: Cabletron likes to sell directly, and most sales today are in the channel.

Under former CEO Bob Levine's tutelage, Cabletron in various ways created many enemies among distributors and value-added resellers (VAR) alike. The stories — some true, others probably not — are legion. Some claim that when Cabletron did go through distributors or VARs, the company would snatch the customer back after the reseller put in time and money cultivating the account. Others charge that Cabletron wouldn't provide enough support and training, or it wouldn't give the distributors enough lead time on new products.

So Reed found himself, hat in hand, going to other two-tier distributors, such as Tech Data Corp., to convince them that this was no longer Levine's Cabletron. Reed admitted that distributors, resellers and integrators "haven't felt very good" about Cabletron. "They saw us as cherry-picking the best accounts and giving them what was left over," the former CEO said in March.

Ultimately, success with the channel may come more from Cabletron's acquisition of the networking division of Digital Equipment Corp. than from Cabletron's diplomacy.

The Digital deal, which was finalized Feb. 9, cost Cabletron $430 million in cash and product credits. Cabletron may have bought itself a few new products, but that wasn't the main reason for the acquisition. What Cabletron wanted was channel sales. Digital had them.

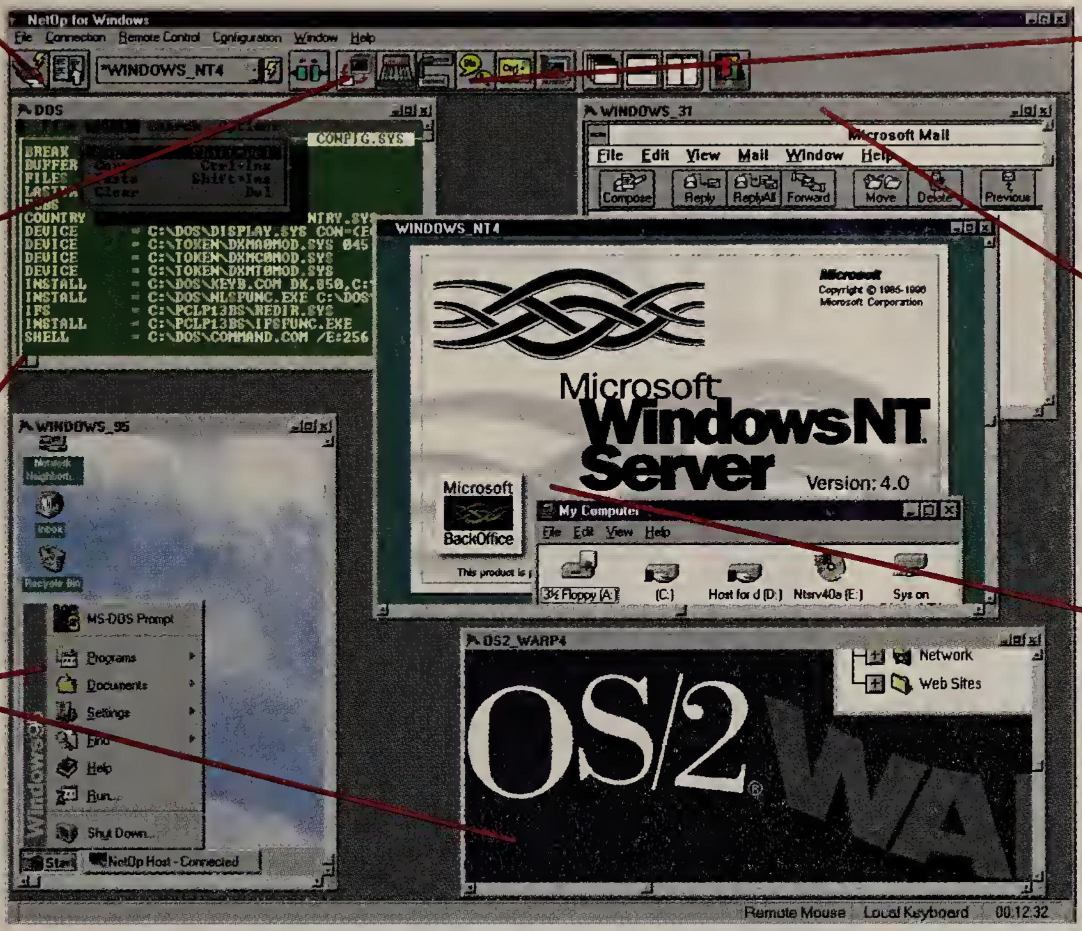
Getting into the channel is not the only major change at Cabletron these days. Reed brought in John d'Auguste, who was in charge of manufacturing at Gateway 2000, as president of Cabletron's new Enterprise Business Unit. In April, Benson promoted d'Auguste to president of operations. "We're going to drive the company based on marketing vs. engineering," d'Auguste said before his promotion.

That may not sit well with Cabletron's engineers, but d'Auguste isn't the type to let that bother him. "If engineering can create the products, then we will do it internally. If they can't meet the time line, there'll be a question: Do we go to the marketplace and OEM it, or do we buy the company?"

Another key goal for d'Auguste is to lower Cabletron's prices. And d'Auguste said he'll be "re-rationalizing a number of old products." Translation: Cabletron will kill off some products. That may include some former Digital offerings, which Cabletron officials estimate overlap with Cabletron products by about 20%.

Cabletron also has big plans for Spectrum, its network management software. Spectrum now will be actively marketed as an all-purpose platform, like Hewlett-Packard Co.'s OpenView.

Cabletron has broached another taboo with the introduction of the SmartSwitch router line, which came from YAGO Systems, Inc.'s multilayer switch technology. The SmartSwitch Router provides wire-speed routing, quality of service, Remote Monitoring 2 accounting and virtual LAN capability. ■



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DEVICE     = C:\TOKEN\DXMC0MOD.SYS
DEVICE     = C:\TOKEN\DXMT0MOD.SYS
INSTALL    = C:\DOS\KEYB.COM DK,850,C:
INSTALL    = C:\DOS\NLSFUNC.EXE C:\DOS
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Netscape taken down a peg

High-flying browser pioneer meets its match in Microsoft.

By Todd Wallack

Just two years ago, no company was hotter than Netscape Communications Corp.

The original Internet company had a lock on browsers, and it looked as if Netscape could become the next Microsoft Corp.

Indeed, when the company went public in August 1995, demand for the stock was so strong that underwriters doubled the initial public offering price to $28 and still wound up doling out the stock to a favored few. Not bad for a 16-month-old company that had never earned a profit and had only a trickle of revenue. But by late 1996, Microsoft and other rivals had embraced the Internet, and Netscape's monopoly started to fade.

Today, the company is losing money, coming off recent layoffs and struggling to defend its market. "Netscape absolutely ran into a wall," says industry analyst Tim Sloane, of Aberdeen Group, Inc., in Boston. "I don't believe their success demands that they [be] acquired . . . but they need to redirect their strategy."

In a nutshell, Sloane says, Netscape's problem is that it can't make money selling desktop clients and is beginning to have trouble at the enterprise level now that larger, stodgier computer companies have Internet offerings of their own.

"People don't perceive Netscape as an enterprise company," he says. To survive, Netscape must transform its image, merge with an enterprise company or strengthen its partnerships with more successful enterprise players, Sloane says.

The most obvious problems have been with Netscape's browser business. But Microsoft's doubly damaging decision to give away its browser and bundle it with its operating system has worn down Netscape's lead. Experts say Netscape has roughly 60% of the browser market. Microsoft owns nearly all of the rest.

But Netscape has taken four initiatives to maintain its dwindling lead:

- Giving away its browser.
- Making its source code available. In a surprising move, Netscape has released the underlying code for its browser so independent programmers can modify it and add new features.
- Selling a stand-alone browser. Netscape originally tried to use its massive browser base as a launching pad for its groupware/e-mail suite, which a user had to install to get Navigator. But when companies such as Lotus Development Corp. balked at distributing the rival suite, Netscape agreed to separate the browser.
- Battling bundling. Netscape helped spark the U.S. Department of Justice's investigation into Microsoft's bundling practices and has already won a small victory. A judge has temporarily barred Microsoft from preventing PC makers from removing its Internet Explorer browser and shipping Netscape with new computers instead.

Despite the dwindling revenue stream, Netscape's browser business will continue to be important because it is key to fueling the company's other segments, particularly its Web business.

With 68 million Netscape users — 40% of whom have left www.netscape.com as their default home page — the company boasts one of the busiest sites on the World Wide Web. RelevantKnowledge, Inc. and Media Metrix, Inc. rank it in the top three most visited sites on the 'Net, and Netscape has tried to turn the site into a free online service offering a full range of news and other content.

But Jim Nail, of Forrester Research, Inc., a research firm in Cambridge, Mass., says Netscape could have trouble maintaining its traffic as more sophisticated consumers and corporations learn to reset the default home pages. "They don't have a natural audience," he says. "They have an accidental audience."

Web revenue last year accounted for about 17% of Netscape's sales, or $93 million. Much of it came from search engines, which forked over big bucks to link their sites to Netscape's. But after steady growth, analysts say the business was flat for the second half of last year. Netscape blamed an accounting change, in which it decided to spread out payments for key partnerships instead of taking an upfront, lump sum amount.

Despite Navigator's high profile, Netscape reaps three-quarters of its revenue from its enterprise server and services businesses, which encompass Web servers, messaging, electronic commerce tools and other programs. The SuiteSpot server suite is its main revenue generator.

But the unit has grown more slowly than Netscape would like and while Netscape did not detail the unit's finances, it did say the unit stumbled badly in the fourth quarter of 1997. Jason Dessel, a client/server specialist at Universal Studios, Inc., in Universal City, Calif., says Microsoft had a big advantage in winning his company's business.

Although many staffers personally preferred Netscape's products, he points out that Microsoft's Internet Information Server comes with Windows NT, plus it is highly integrated with Microsoft's messaging system and other products. "Everything's built in," Dessel says.

None of this is meant to imply that Netscape is on the verge of going under. NationsBanc Montgomery Securities, Inc. analyst Greg Vogel thinks the company will turn a profit again in the second quarter. But eventually, Vogel thinks Netscape will have to merge with a larger enterprise company. ■

NETSCAPE

JASON GROW

Headquarters: **Mountain View, Calif.**

Founded: **April 1994**

Employees: **Over 3,000**

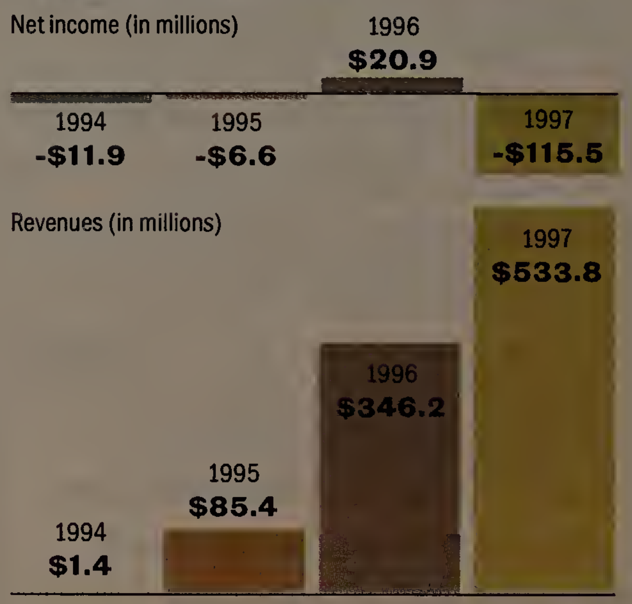
Management: **Jim Barksdale, president and CEO; Marc Andreessen, vice president of products**

Main products: **Netscape Communicator and Netscape Suitespot and FastTrack servers**

1997 acquisitions: **DigitalStyle, Kiva and Portola**

Fun fact: **Netscape's Web site receives more than 120 million hits every day**

Netscape is in third place in the Web server field, behind Apache and Microsoft, with a 10% market share according to a March 1998 survey by Netcraft.



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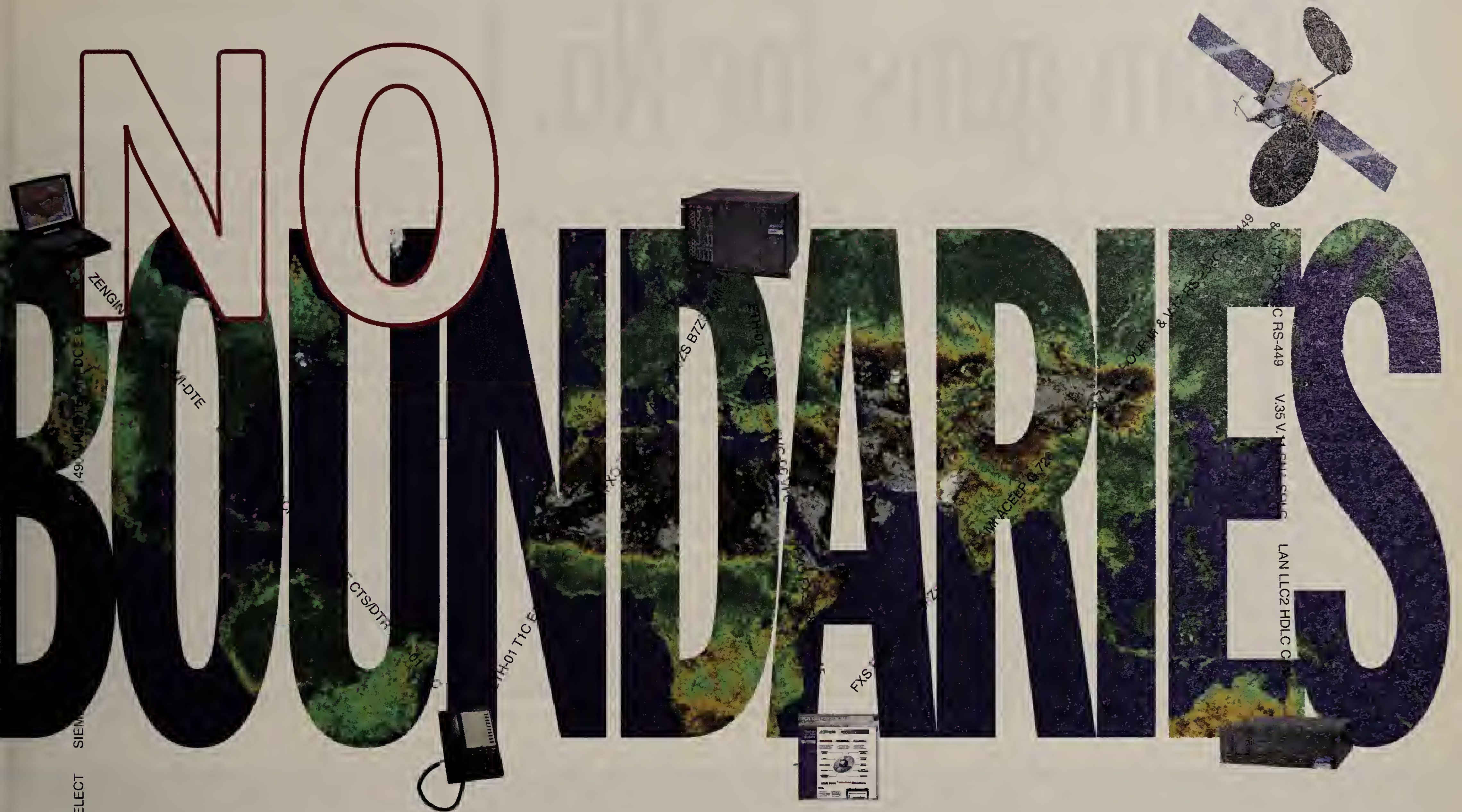

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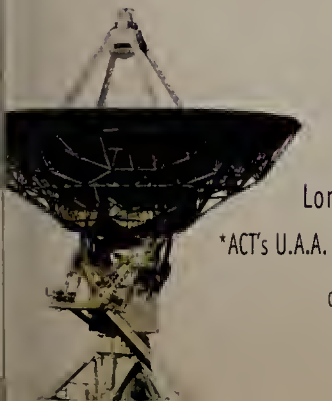
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3Com guns for No. 1

Company banks on switch to real-time data for growth.

By Tim Greene

3Com Corp. thinks it holds all the cards it needs to shake up the rankings of the Big Four network equipment companies.

And because 3Com already is No. 2, that leaves it with just one place to go — up — to the top spot tightly held by Cisco Systems, Inc.

The company plans to rise by exploiting change. More specifically, 3Com sees networking changing from a landscape dominated by store-and-forward functions to one ruled by real-time applications such as voice and video.

In 3Com's view, making the transition means imposing quality of service on real-time packets at the desktop and maintaining that quality as the packets make their way across carrier networks to distant devices.

3Com is working on such a network priority scheme, and a comprehensive management platform for it, but the company has its skeptics. "There is nothing to indicate 3Com is going to jump ahead of Cisco any time soon," says John Morency, an analyst with Renaissance Worldwide, a consultancy in Boston.

Although 3Com's roadmap calls for quality assurance across the WAN, the company doesn't actually own any WAN switches, Morency notes. And while speed is key to real-time applications, 3Com for the moment is foregoing the gigarouters being developed by Cisco and other competitors, he says.

But 3Com doesn't see those things as being problems, according to Ronald Sege, 3Com's senior vice president for enterprise systems and global products.

For wide-area switching, 3Com is relying on alliances with Newbridge Networks, Inc. and Siemens Corp., and backs switch-based routing rather than software-based gigarouting.

Relying on an alliance rather than outright ownership for wide-area switching poses two problems, according to Brad Baldwin, an analyst with International Data Corp., of Framingham, Mass. First, Newbridge could form alliances with 3Com's competitors. And second, Newbridge could be bought by someone else.

But 3Com does not see Newbridge's and Siemens' independence as a problem, Sege says. "We have a good relationship with Newbridge now. I don't know what would be gained by [us acquiring Newbridge]," he says.

Cisco, however, already owns a successful line of carrier-class switches.

3COM TRUMP CARDS

3Com says its trump card is the hardware-based CoreBuilder 9000, which is an enterprise switch-router with LAN and WAN interfaces. 3Com claims the device is 10 times as fast and a tenth the cost of traditional routers. Cisco lacks this type of device, which 3Com already has for sale.

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But Morency says the CoreBuilder 9000 will not topple Cisco. The product will sell well, as will new SuperStack remote access gear and 10M/100M bit/sec Ethernet network interface cards (NIC), he predicts. "But I don't see a gain of $2 billion to blast by [3Com's] competitor," Morency says. Cisco last year posted revenue of $7.3 billion.

The bulk of 3Com's business lies in NICs and modem products. Modems, however, have not been an easy business lately. 3Com bought its way into modems when it picked up U.S. Robotics' offerings last year in a $6.6 billion stock swap.

With the deal has come the usual loss of momentum for both companies as they try to become one, according to Baldwin. 3Com also bought itself a chunk of the 56K bit/sec modem standards battle.

Despite pitching U.S. Robotics' proprietary fast modems, 3Com has won a good slice of the early adopter market. With a preliminary standard finally in place, the challenge now lies in capturing an even bigger share of the fast modem market.

At the same time, the merger meant making management of U.S. Robotics' Total Control remote access concentrator possible through 3Com's Transcend management software. This should be accomplished this year. U.S. Robotics hardware already has been adapted and integrated into 3Com's SuperStack Access 3000.

Meanwhile, 3Com is going forward with its end-to-end quality-of-service technology. The company is giving its network hardware the intelligence to establish classes of services at the desktop that can be extended across the LAN and WAN. In 3Com's scheme, intelligence in the NIC establishes a class of service and, via an extension of Multi-Protocol over ATM, that request is passed along by other LAN devices to ATM switches in the WAN.

Despite the difficulties, Sege says he is looking for this year to be of historic importance for the company. "I want people to look back 10 years from now and say Cisco was the IBM of networking, and along came 3Com and Cisco became the Digital Equipment Corp. The world changed from sending e-mails around and doing file transfers to making telephone calls," Sege says. ■

3COM

JASON GROW

Founded: 1979

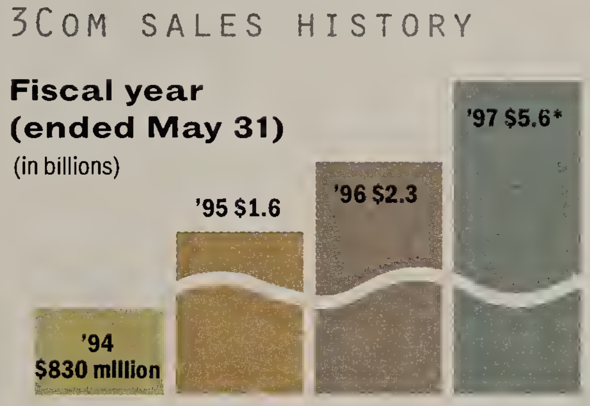
1997 revenue: $5.6 billion (including revenues from U.S. Robotics)

Market capitalization: $13 billion

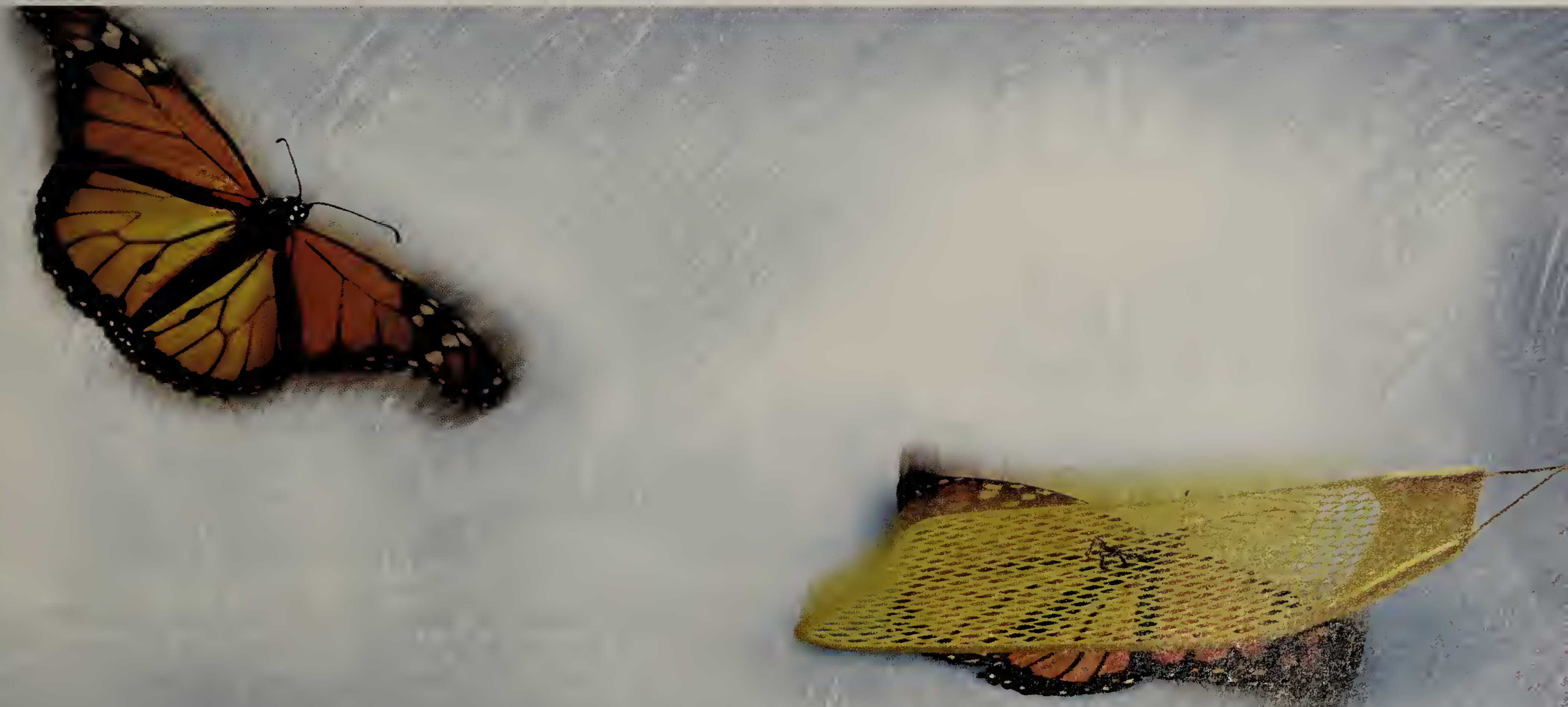
Employees: 13,200

Acquisitions: Spent $10.4 billion since 1992 to buy 14 companies, including $7.3 billion to buy U.S. Robotics in 1997.

Main products: Network interface cards, modems, switches and remote access concentrators.



* Includes $2.5 billion from U.S. Robotics revenue



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Cisco: Impenetrable force?

Network giant has all the bases covered, or so it hopes.

By Jim Duffy

Cisco Systems, Inc. is the undisputed king of data networking, far outdistancing rivals 3Com Corp., Bay Networks, Inc. and Cabletron Systems, Inc. in revenue, profit, product breadth, influence and installed base.

Cisco is present in virtually every aspect of an enterprise and WAN. Cisco's switches and hubs connect desktops into LAN segments that are grouped into subnetworks by Cisco routers. The routers then connect these enterprise subnets to the WAN, which is populated by more Cisco routers and StrataCom switches for access to the Internet or public or private data network services such as frame relay and ATM.

Now Cisco is extending its success in data networking into the world of voice and is doing so with circuit emulation and voice-over-IP extensions to its broad product portfolio.

If Cisco made LAN interface cards, PBXs and central office switches, it would be a true end-to-end supplier of integrated voice/data and video networks. Cisco is partnering with specialists in these areas to fill out what it cannot already offer.

CHALLENGES AHEAD

Though Cisco faces some significant challenges in the years ahead, analysts say none are likely to knock Cisco off its perch. "Cisco is still the king," says Scott Heritage, vice president of equity research at UBS Securities, in New York. "They have their problems here and there, but the fact is, no one has a more complete end-to-end solution than Cisco does. Hands down."

"Our challenge and our opportunity continues to be the preferred end-to-end networking supplies," says Jayshree Ullal, vice president of enterprise networking. Some of the challenges Cisco faces going forward are in balancing its installed base of Cisco 7X00 routers and Catalyst 5X00s with innovations in Gigabit Ethernet switching and wire-speed, gigabit routing for the enterprise. Cisco is being leapfrogged by start-ups and established competitors in both of these product areas.

CISCO

JASON GROW

Headquarters: San Jose, Calif.

Fiscal 1997 revenue: $6.4 billion

Management: John Morgridge, chairman; John Chambers, president and CEO

Employees: 12,100

Acquisitions: 21 since 1993, including Crescendo Communications, LightStream, Kalpana, StrataCom and Granite Systems

Products: LAN Routers, LAN and WAN switches, dial-access server and concentrators

History: Since shipping its first router in 1986, Cisco has grown into a global market leader. Since becoming a public company in 1990, Cisco's annual revenues have increased from $69 million in that year to $6.44 billion in fiscal 1997. In terms of market capitalization, Cisco is the third largest company on NASDAQ and among the top 40 in the world.

The slow growth of Cisco's 7X00 routers is a drag on the company's overall growth, but routers still account for 45% of Cisco's total revenue, according to UBS. Unfortunately, that technology is experiencing single-digit year-over-year growth and becoming a legacy product line.

On the other hand, Cisco's WAN switching and remote access businesses are strong. WAN-switch bookings this year were $165 million in Cisco's second fiscal quarter — which UBS believes is a record for Cisco — and remote access revenue was $135 million, a 50% increase over last year.

But as Cisco extends its presence into more nooks and crannies of the enterprise and WAN, the company takes on a new cadre of competitors. And just as Cisco is expanding into new territory, these competitors are looking to branch out into areas where Cisco has traditionally been a leader.

At the low end, the new competitors include PC stalwarts Compaq Computer Corp. and Intel Corp. Compaq and Intel are getting into network hardware in a big way, including routers and switches — Cisco's bread and butter.

But again, the damage to Cisco should be slight because it sells mainly through direct channels, in which face-to-face customer interaction is key to winning the deal. "What the customer is really getting is the handholding, the service and support and the relationship, which basically you don't get from commodity PC vendors," says David Passmore, president of NetReference, a consultancy in Sterling, Va.

Microsoft Corp., meanwhile, is metamorphosing Windows NT into more of a network operating system. Microsoft has added routing to Windows NT through its Steelhead project and will be integrating directory services — which are key for user- and policy-based network access — and remote access hooks into NT 5.0.

Microsoft is actually working with Cisco on the Directory Enabled Networking initiative. But the collaboration should not conceal the impending competition as Cisco's direct competitors begin to offer NT-based network gear.

From the high end, Cisco is seeing the traditional WAN equipment vendors, Lucent Technologies, Inc. and Nortel, encroaching on its data turf at the same time that Cisco is building up its voice prowess. These companies are aligning with or acquiring data network vendors in an effort to gear up for advances such as voice over IP and Internet telephony.

Lucent recently bought Gigabit Ethernet start-up Prominet Corp. and remote access router vendor Livingston Systems, Inc. And Nortel recently formed an Enterprise Networks Data unit that combines the company's packet and fast-packet switches with the remote access concentrators obtained from its acquisition of Micom, Inc.

Both Lucent and Nortel have investments in router start-up Juniper Networks, Inc. and are reselling frame relay access devices. "We see that Lucent and Nortel could be competitors or could potentially be partners," Ullal says. "Clearly, at this point there are two different approaches: one from the voice side, one from the data side."

But voice is looking to ride on the data network, not vice versa. So the onus is on Lucent and Nortel to go out and hunt for data expertise, while Cisco merely adds voice to its data arsenal as if voice were another protocol, analysts say. ■

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Technology Driven Networks

AT&T under Armstrong

New CEO must build new business and take care of the old.

By David Rohde

If AT&T executives want to save their company and see it prosper again, they could start by taking this piece of advice: Throw away all the books and articles about big companies that fail because nobody wants their products anymore.

AT&T

KENNETH GABRIELSEN

Not stepping up to the plate?

AT&T officials acknowledge "phenomenal demand" for their business voice and data services, yet year-over-year revenue growth is anemic:

Q4 1997 business network services revenue: **$5.543 billion**

Q4 1996 business network services revenue: **$5.382 billion**

Increase: 3.0%

It's now clear that AT&T's big problem is an amazing ability to underestimate the demand for its products.

While some of the company's officials continue to moan over shrinking margins on telephone calls and the supposed crimes of the regional Bell operating companies, AT&T's new CEO is trying to get them to understand how much more revenue is to be had simply by meeting the soaring bandwidth demands of the market.

But can AT&T chief Mike Armstrong deliver? Observers agree he would have had a better chance when the job first opened up back in the fall of 1996. That's when former CEO Bob Allen began wasting nearly a year unsuccessfully training a printing company executive named John Walter to be his successor.

While that was going on, the year 1997 laid bare the yawning gap between the demand for broadband capacity and the available supply.

Now in 1998, an emboldened MCI Communications Corp. is preparing to drive AT&T's market share below 50% for the first time with the help of merger partner WorldCom, Inc. and their potent combination of nearly 100 local Synchronous Optical Network (SONET) rings.

And at least four new national carriers, along with dozens of new local carriers — some headed by disgruntled former Allen underlings such as Qwest's Joe Nacchio and Teligent's Alex Mandl — are hoping to teach AT&T a lesson.

Insiders say the company still is driven by division between go-slow executives who believe their own propaganda about why telecom reform isn't working from a legal standpoint and those who point out that users will demand wide-area bandwidth regardless of what technical issues are tied up in court. Against this background, Armstrong still has a great deal of work to do.

"He is saying all the right things," says Reginard Bernard, president of the Enterprise Networking Technologies Users Association, AT&T's broad-based user group. "I think [Armstrong] has a very good chance of putting [AT&T] on a more disciplined footing."

But so far, that hasn't meant a change in AT&T's single biggest problem: A shortage of ports and circuits to handle T-1 and even subrate dedicated access facilities.

"AT&T's installation intervals are somewhat longer than the competition," says Bernard, who is also assistant director of communications services at State Farm Insurance Co., in Bloomington, Ill. Others are even more direct: "They've basically told their salesmen to stop taking orders or slow down taking orders," says Berge Ayvazian, executive vice president of The Yankee Group, a Boston-based telecommunications consulting firm.

BIG VACANCY NEAR THE TOP

Just a step down the organization chart from Armstrong and new president John Zeglis is where you can probably find the root of the problem.

AT&T is such a big company, with so many peripheral issues on its plate (such as how much money to contribute to Olympic sponsorship or how to counter tricky TV ads by rogue carriers such as 10-321) that the CEO's relationship to professional network managers is more indirect than that of, say, John Chambers of Cisco Systems, Inc. or David House of Bay Networks, Inc.

For example, the top executive of AT&T who deals with corporate users is the executive vice president for business markets. That position is now vacant following two years of turmoil. Shortly after Armstrong arrived, Executive Vice President Jeffrey Weitzen left AT&T to become president of Gateway 2000, Inc. That was after Weitzen's short stint succeeding Gail McGovern, who in 1996 was urgently shifted over to executive vice president for consumer markets to stem losses to Sprint's dime-a-minute offer and the pesky dial-around carriers.

That leaves two obvious inside candidates for a successor: Weitzen's deputies Ken Sichau on the voice side and Bob Aquilina on the data side. In a move that spooked some analysts, it was Sichau who sat in the executive vice president's chair during AT&T's lineup of executives at its January confabulation in New York with Wall Street analysts. That bodes ill for focusing AT&T on the critical data challenges ahead, some say.

For example, on frame relay service, "they've been running far behind their six weeks' install time," says Johna Till Johnson, an analyst at Meta Group, Inc., in Stamford, Conn. "They've got not enough people and not enough switches."

AT&T's capacity crunch is having numerous side effects. At some points over the past year, some requests for proposal from AT&T have simply been ignored, says Tom Walton, president of Walton & Walton Associates, Inc., a mid-Atlantic regional network design consulting firm, in Richmond, Va. And those requests aren't just from the small customers, either. He noted one case in which a well-known financial services company in New York was seeking eight to 10 T-1 access lines to AT&T in Maryland. "There was so much work backlogged that the [account] team couldn't get to the work because of the backlog in placing orders," Walton says.

Specialized overlays on T-1 lines, such as ISDN Primary Rate Interface orders, have posed additional delays, Walton adds. "Recently, there just were not enough ports for D channels" for the same financial services firm.

FIRST COME, FIRST . . . BLOCKED?

Armstrong may be enjoying a honeymoon with Wall Street and the press, but a tough period may be just ahead because AT&T can't possibly clean up its capacity problems all at once.

"It's just going to get worse from here on out," Johnson says. She notes that new federally mandated charges to help pay for universal service are about to

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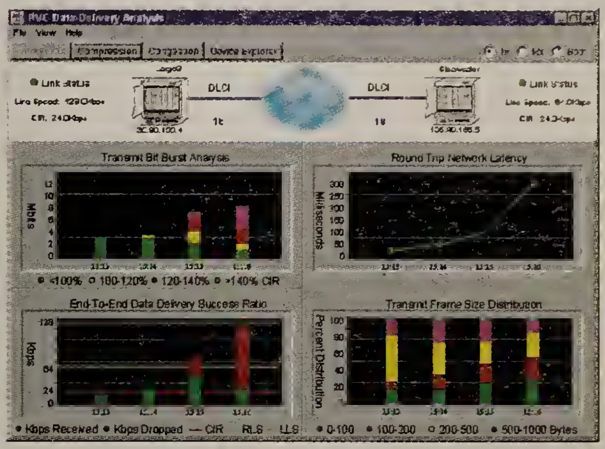

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kick in on switched access lines. “So now there's going to be a run on T-1 and subrate circuits, such as 56K and 64K [dedicated access lines],” she says. “A lot of customers are going to run out and buy leased lines where they had none before.”

Armstrong's solution is to buy hundreds of new central office-class switches — both for circuit-switched and packet-switched traffic — and place them closer to the customer. Walton fully endorses Armstrong's call for an edge switch architecture. “They're at a point of no return,” he says. “And the answer is to bring some of the [trunk terminations] out of the building and maybe concentrate them.”

By dramatically slimming down the company and indicating that savings will go back to customers before shareholders, Armstrong's strategy gives AT&T a chance to win back those for whom price means everything — and those who had written off AT&T as a viable option years ago.

One of the reasons MCI and WorldCom have made so many inroads into the commercial and investment banking industries is that for all their size, companies in those fields basically operate on thin margins and must save on operating costs such as telecommunications.

For example, global currency and securities trader Prebon Yamane, Ltd. currently operates a private WAN running over 400 leased lines from GTE Corp. and WorldCom.

“I'm glad to see Armstrong turning it around and saying he's going to compete on price,” says Gary Backer, director of global communications at Prebon Yamane, in New York. “They have been able to win things on their own [name], not because of their price performance.”

“I think [Armstrong] has a very good chance of putting [AT&T] on a more disciplined footing.”

Reginald Bernard
Enterprise Networking Technologies Users Association

Yet even AT&T's own users note a number of pesky AT&T pricing policies that continue to survive of their own volition, almost as if there never were a new CEO who wanted to compete on price.

One is AT&T's habit of passing along all costs it can blame on somebody else, notably regulators. If anything, AT&T has become more militant on this issue over the past year, customers say, making it nearly impossible for users to sign contracts often recommended by lawyers and analysts that freeze prices during the term of a contract. A notable example is the so-called pay phone controversy, in which AT&T has raised the price of terminating 800 calls four times in the past 15 months and has added a calling-card surcharge all because of a new federal regulation forcing them to compensate pay phone owners for coinless calls carried over the AT&T network.

“They have passed on all the charges, and they probably passed on administrative costs that we don't feel are totally equitable,” Bernard complains. ■

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The name game

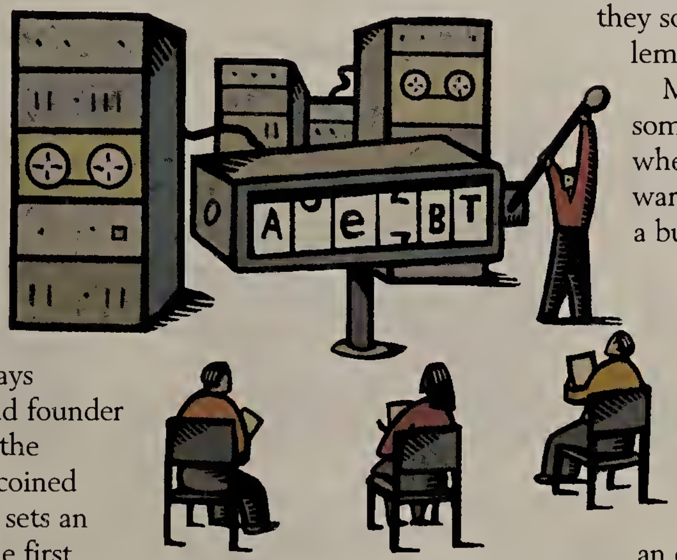
When it comes to corporate names, image is everything.

By Paul McNamara

When AT&T spun off its $26 billion systems and technology business two years ago, executives chose the name Lucent Technologies over some 700 other possibilities, including the acronym AGB.

AGB? No, it doesn't stand for Another Global Behemoth.

AT&T decided that the definition of Lucent — glowing with light and marked by clarity — better conveyed 21st century telecommunications than did the monogram of 19th century inventor Alexander Graham Bell.



A big part of corporate success rides on such calls, according to the consultants who earn a living helping corporations name themselves and their products.

"The corporate name is really the cornerstone of a company's relationship with its customers," says David Placek, president and founder of Lexicon Branding, Inc., the Sausalito, Calif., firm that coined Pentium for Intel. A name sets an attitude and tone and is the first step toward a personality, he says.

Name your search engine company Yahoo! and some might question your sanity, but no one will accuse you of lacking personality. Folklore holds that Yahoo stands for Yet Another Hierarchical Officious Oracle, but company founders David Filo and Jerry Yang insist they chose the sobriquet simply because they considered themselves to be yahoos.

Success has proven them wrong.

On the other end of the personality spectrum, Bill Gates may have sealed his enduring reputation for stodginess early on when he fashioned Microsoft from "microprocessor" and "software."

"The biggest pitfall is for someone to say, 'We're in fiber technologies, so let's call ourselves Fibertech,' " Placek says. He admires executives who have the guts to take a risk when they name their businesses. Placek points to online book purveyor Amazon.com as an example.

Even if a company isn't unique, that doesn't mean its name can't be. Take Ethernet router YAGO Systems — Yet Another Gigabit Operation — the Gigabit Ethernet router vendor Cabletron Systems, Inc. recently acquired. And few monikers rival the frivolity of the now defunct NBI, which stood for Nothing But Initials.

However, some corporate names are more puzzling than provocative, at least until their origin is made clear.

Take Inktomi Corp., of San Mateo, Calif., for example. Inktomi is derived from a spider depicted in Lakota Indian mythology that was able to vanquish much larger foes through intellect as opposed to brawn.

"Conquering larger enemies through cunning and wit has a lot of parallels to the way that we build software," claims Kevin Brown, a company spokesman. "We put clusters of small computers together and they solve very large problems as a group."

Maybe, but there's some risk involved when you name a software company after a bug.

When Michael Cowpland and Terrence Matthews launched their Canadian PBX firm 25 years ago, they originally planned to market an environmentally sound lawn mower that mulched while it cut. They took a shine to the name Mike & Terry's Lawnmowers. That lawn mower never got off the ground, but the acronym Mitel — for MIke & TErry's Lawnmowers — stuck. Cowpland later founded software vendor Corel Corp., which comes from COwpland REsearch Labs.

Prague-based Software602 started out in 1989 as a computer club that was assigned the registration number 602 by its then-Soviet overseers. Once the club was allowed to commercialize, company executives decided to keep the name.

Some corporate monikers are not at all what they seem to be.

Shiva was named in 1985 for what was then the world's fastest laser, "not the goddess of destruction and rebirth," insists a company spokeswoman.

Despite its shiny logo, Sun Microsystems' name has nothing to do with the star. It stands for Stanford University Network, the company's prototypical workstation.

Although Sprint may sound like a consultant-generated name to connote fast telephone service for a fast-paced world, the word actually is an acronym for Switched PRIvate Networks Telecommunications.

First impressions aside, a start-up's attention-grabbing name can become an image burden if and when the corporation matures, experts warn.

"Yahoo is doing incredibly well now, and the name is provocative and playful," Placek says, but the offbeat

NAMES FROM A TO Z

Company	Origin
Apple	Founder Steve Jobs came up with the name
Banyan	A tree common in co-founder Anand Jagannathan's native India
Bay Networks	Product of merger of Wellfleet and Synoptics, which were both located near bays
Bright Tiger	From poet William Blake's "The Tiger"
Brooktrout Technology	Founder Pat Hynes likes fly fishing
Cisco	Headquartered just south of San Francisco
Compaq	From compatibility plus quality
Cubix	Cube-shaped product ran on Unix
Davox	Previously was Data Vox, for data and voice
Diamond Lane Communications	The car-pool commuter lanes that use the diamond symbol
FORE	The first initials of founders Francois Bitz, Onat Menzilcioglu, Robert Sanom and Eric Cooper
HolonTech	Derived from the Greek words "holos," meaning whole, and "on," meaning individual
Inktomi	A spider from Lakota Indian mythology that conquered enemies through cunning and wit
Intel	Short for integrated electronics
Lucent	Means glowing with light and marked by clarity
Microsoft	From microprocessor and software
Mitel	MIke and Terry's Lawnmowers, by founders Michael Cowpland and Terrence Matthews
NBI (now defunct)	Nothing But Initials
New Oak	A new barrel used by vintners
Shiva	What was then the world's fastest laser
Software602	A Czechoslovakian computer club's Soviet-issued registration number
Sprint	Switched private networks telecommunications
Sun Microsystems	Stanford University Network, the company's first workstation
The Orange Brain Company	Founder had an orange Nerf brain football
Xylan	X and Y represent coordinates on a matrix
Yahoo!	Founders considered themselves yahoos
YAGO	Yet Another Gigabit Operation
Yurie Systems	Name of founder Jeong Kim's daughter
Zoom Telephonics	Founders wanted name to imply speed

moniker could date the company to a particular period in technology.

It's unlikely, however, that Yahoo would ever be mistaken for another company. The same can't be said for Micom, Microcom and Microdyne or Xircom, Xylan, Xylogics and Xyplex. These copycats and others of the ilk have melded themselves into a meaningless mishmash, according to James Dettore, president and CEO of Brand Institute, Inc., in Miami.

"In the early '90s, there was this big wave of high-technology names with Xs on the end, Zs and Xs at the beginning and prefixes," Dettore says. Although the names were arresting at the time, there are now so many similarities that it's confusing, he says.

Does that mean these dime-a-dozens ought to change their names? Not necessarily, given what is involved in making such a switch.

Ralph Faison was advertising and brand management vice president at AT&T when Lucent spun off from AT&T. Even with AT&T's deep pockets and help from consulting firm Landor Associates, his team faced a daunting job.

"We had about 12 weeks to come up with a brand and personality for a $26 billion company," Faison says of the deadline dictated by an impending initial public offering. "Several companies we initially talked to wouldn't even consider the project, because they thought a quality job could not be done in that short a period of time."

The newly named company had to issue Lucent stationery and business cards to 120,000 employees, paint 11,000 trucks and replace signs on 1,100 buildings. Faison wouldn't divulge the cost of Landor's services or the Lucent makeover, but says, "It's not something we would want to do every year."

The payoff on such an investment may not be immediately apparent either, given that any new corporate name comes by definition with a low profile. Though Lucent now has semi-household-name status, it took several years and million of dollars worth of branding efforts to achieve. ■

All the good ones are taken

The emergence of Internet commerce has made the process of finding an appropriate company name more difficult.

"It's a tremendous advantage to have a company name that is the same as your domain name," says Linus Upson, chief technology officer of a handheld computer software start-up in San Mateo, Calif., that intends to do business over the Internet.

Finding a name proved much easier said than done for Upson and his colleagues. "Since the Domain Name System is truly global, names that are words, or even sound like words, are a scarce resource," Upson says.

Many domain names his company liked were already taken. Some of the holders had no real use for the names but wanted up to $20,000 to give up their rights to them.

Upson's company even tried creating its own name-selection software that mapped the entire DNS against the English dictionary. The sifted list of unclaimed domain names was amusing but not useful, he says.

Eventually, a company employee thought up the winning name: AvantGo, Inc.

— Paul McNamara

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— **James Bryant Conant,** American educator and diplomat

Skimming the cream off the top of the *Network World 200* will leave you with a ladle full of huge companies. But size alone does not equal greatness. Plenty of large companies are searching for focus and struggling to realign themselves.

We tracked down four industry leaders who are excelling, hoping for a glimpse into how they manage to succeed where others have failed. Most of them had to weather criticism and skepticism on the road to success. But succeed they have.

Eckhard Pfeiffer,
Compaq Computer Corp., president and CEO

Eckhard Pfeiffer ultimately may best be remembered as the industry icon who multiplied $3 billion in revenue into $25 billion in a short six years. But then again, maybe he's just getting warmed up. With the recent acquisitions of Tandem Computers, Inc. and Digital Equipment Corp., Compaq has changed the rules of the game – and the competitive landscape. Pfeiffer is turning the PC company into a world-class systems player that will be able to bid on any computer deal. He discussed his strategies and thoughts with *Network World* Editor John Dix and Staff Writer Marc Songini.

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Bernard Ebbers,
WorldCom, Inc., chairman and CEO

As head of the merged WorldCom and MCI Communications Corp. company, Bernard Ebbers is poised for a head-to-head battle with AT&T for domination of the U.S. telecommunications industry. Like the story behind the rise of Compaq in the computer industry, Ebbers' record is monument to taking action while competitors – some of whom aren't even aware of his presence – dawdle and hesitate. Ebbers describes the roots of WorldCom's leap to prominence in a discussion with *Network World* Senior Editor David Rohde.

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Richard McGinn,
Lucent Technologies, Inc., president, chairman and CEO

Richard McGinn was appointed CEO of Lucent in October 1997, and in February he picked up the title of chairman, succeeding Henry Schacht. Schacht and McGinn are credited with turning in seven straight quarters of record-setting revenue since the company spun off from AT&T in 1996. Their latest achievement: 1997 revenue of $27 billion, up 14% from 1996. The price of Lucent's stock, the second most widely held in the U.S., has tripled since the company went public. *Network World* Features Editor Paul Desmond spoke with McGinn about how he achieves such impressive results and what lies ahead for Lucent.

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David House,
Bay Networks, Inc., CEO

David House and Bay married in late 1996, and the honeymoon still hasn't ended. So far, the former Intel Corp. executive has proven to be Mr. Right for Bay, turning million-dollar losses into million-dollar profits. House says he has tried to focus Bay, setting quantifiable goals for managers and other employees. He also has orchestrated several acquisitions, enabling Bay to stay on track while quickly getting into hot markets. House recently spoke with *Network World* News Director Bob Brown about his strategy for maintaining Bay's momentum.

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Eckhard makes it look easy

Compaq CEO Eckhard Pfeiffer banks on his bold vision.

By John Dix
and Marc Songini

What does it take to succeed in this turbulent market?

Clearly, the customer relationship is No. 1. You want to be in a position where you're invited to the table for major corporate information technology initiatives, which requires competence overall. And I think with the acquisitions of Tandem and Digital, Compaq clearly has the capability to support not only any national corporate account, but any global enterprise account.

JOHN ABBOTT

Is the service and support organization the crown jewel in the Digital Equipment Corp. acquisition?

I wouldn't call it the crown jewel. It's certainly a very important aspect of it. It's roughly 40% of the company in terms of people and resources, and accounts for, I'd say, just under 50% of revenue. But there are a lot of other valuable assets, from the field sales organization to the customer base.

To what degree do you take responsibility for Compaq's success?

I think it's been probably one of the more spectacular growth periods of any company. Back in '91 [when I took over], we were about a $3 billion company. Last year, we were $25 billion.

What I take credit for is going public back then with a major new direction for the company when there were few other senior people around. A large group left at the time. And that's when we laid the foundation for Compaq's completely different focus, from what we were in those days — a premium product, premium price company — to serving every PC need of any customer.

But now we don't want to limit ourselves to moving at the speed of Intel's chips and Microsoft's operating system. If we would have stuck with that strategic direction exclusively, we would have been aced.

Whom do you admire as a leader?

Jack Welch from [General Electric]. He's given the company, at different points in time, a significant new direction that turned out in each case to be very beneficial to the company. I think that's what it takes: constantly reinventing yourself and the company for future growth, because things keep changing so fast.

With Digital you have acquired OpenVMS and Digital Unix. Ultimately, do some of these go away?

Our customers are saying, "Assure us that you're not going to force us overnight to go to something else." And we said to them, "Be confident. We will continue to support these products until a different hardware architecture and related [operating systems] and application solutions give you exactly what you need." And whether that's five years from now or seven depends very much on how the technologies evolve. When will an [Intel] Merced generation be meeting all new requirements? When will industry-standard operating systems be able to meet their requirements?

What will be the new integrated pitch?

The big pitch is simply this: We can now give you your total enterprise solution. We can take on full responsibility and accountability. Almost regardless of what the customer's requirement is, we have the resources to carry it through to completion.

Compaq has verbalized plans to be one of the top three network players. How will you do that?

That's a strategy that is still evolving. We have made some good steps in 1997 with the acquisition of Microcom. This is working very well. We are mobilizing our global sales organization to sell the product in a highly organized way and establishing our position in the market.

In addition to that, we are looking at the strategic direction that we need to take. It will include partnering.

Do you view networking as a way to bolster your server/PC business or as an opportunity unto itself?

That's a possibility we're looking at strategically and could end up working with others who have more of a tradition in sectors that we believe will be of great interest in the future.

There's a lot of this IP-everything theory kicking around, the idea that networks will carry data, video and voice in IP packets. Is there voice in Compaq's future?

I think it will be a factor. I think where you have a given infrastructure, always something new comes up. It will take time, but it will clearly be a major factor.

Any guess on the time frame? Five years from now, 10 years?

I think it won't be that long. In my experience, everything around the Internet has developed faster than everybody anticipated, and I think that will be true here, as well.

Does the Tandem and Digital deal change your relationship with Microsoft?

It strongly enhances it. Besides us, who would you say is the next closest ally to Microsoft? Digital. Together we have the largest base of NT-accredited engineers in the world. I think that's where enormous power lies in this alliance. ■

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White-hot, burning Ebbers

WorldCom chief Bernard Ebbers catches the industry napping.

By David Rohde

To what do you attribute your company's success?

The hard work of our employees and the strong relationships with our customers. We've also made strategic investments targeting the industry's biggest growth opportunities and worked effectively to integrate new capabilities that benefit our customers.

We have one of the world's most advanced communications platforms, [which is] capable of supporting the exploding demand for Internet, data and IT solutions. And we can deliver these solutions on an end-to-end basis entirely over our own network, ensuring the quality of service our customers demand.

PHILLIP GOULD

What are the most important attributes that will help guarantee future success?

Customer service and low costs. No market is moving faster or is as unpredictable as the communications industry today. While you've got to be decisive and opportunistic with respect to acquisitions, your employees have to stay focused on the day-to-day business.

What, if anything, would customers most like to see change at your company?

Our customers would like us to be able to provide local service. MCI WorldCom will offer local service over its own networks in more than 100 markets, putting us within reach of 40 million consumers and 70% of business customers. But local competition has been delayed by the local monopolies that continue to postpone the benefits of competition for many customers.

How much do the contentious industry politics affect your network investment strategies?

There's no doubt the local monopolies have stalled the arrival of wide-scale competition. We can't depend on those carriers to provide access to their network, and that's why we feel so good about our acquisitions of MFS, Brooks and our pending merger with MCI.

You run a pretty lean ship. How do you keep it that way?

In an increasingly competitive industry, cost structure will become an important differentiator among competitors. WorldCom for years has led the industry with the lowest [selling, general and administrative expenses] as a percent of revenue and the highest revenue per employee. We achieve that by focusing on cost control.

In your dealings with customers, what is their top network concern?

The burden of dealing with multiple vendors. Often they're dealing with equipment vendors, a local service provider, a long-distance provider and a systems integrator. It doesn't need to be this cumbersome, and we are working hard to be a single source for more of our customers.

What advice would you give chief information officers and telecommunications managers trying to budget for ever-increasing bandwidth needs?

Budgeting for bandwidth is less of a challenge than finding a partner that can match bandwidth with flexibility in terms of supporting advanced applications. My advice is to find a company that can provide the entire package: end-to-end high-speed transport, systems and network management, and solutions that are designed to make your business more productive.

How do you plan for shifts in technology? How can you make sure you don't invest in passing fads while still building to meet ever-growing demand?

There aren't many certainties when it comes to technology, but we know data traffic will soon surpass voice traffic and our customers will demand ever-increasing capacity to support Internet and other data applications. We're building to meet this demand, and we don't spend too much time worrying about changes in technology since we're not locked into any single technology. Our network is flexible and can be customized for customers' specific needs.

How do you find and keep qualified personnel in today's labor market?

This has become one of the biggest challenges in our industry. We're still a relatively small company with strong prospects for considerable growth. That's cause for a lot of excitement, and that's what keeps people around. The performance of our stock is also part of the excitement at WorldCom, and we make sure that all employees at every level have a stake in the company.

What is your view of convergence? Will voice and data ride side by side, and if so, when?

To an extent, they already do. We've seen some interesting services that let travelers access their voice mail over the Web. And of course, most consumers use the voice network to access the Internet. But only competition will create the investment required to support the kind of end-to-end high-bandwidth access that will support voice and data applications on a single line. We plan to spend more than $5 billion in 1999 to build on our fiber-optic network. This kind of continued investment will drive the economics of the industry. ■

Lucent's guiding light

Richard McGinn stays close to customers to keep on top.

By Paul Desmond

Lucent has a presence in lots of different areas, from the consumer market to business customers to carriers to pure research and development. Given all these markets, how do you keep people focused?

Last fall, we segmented the company according to customer sets to make in essence 10 smaller companies, each of them focused on the hottest growth areas we've got.

In doing that, we aligned people with specific targeted markets. So there's a great deal of line of sight and people know the pulse of their customers, their competitors and their markets every day.

JOHN ABBOTT

With the pace of change in this industry, there's a lot of talk about the need to make decisions quickly. What would you say are the keys to making quick but effective decisions?

Be connected to the business in an intimate fashion so you have enough information to make informed decisions, and then just do it.

There's a great line from the movie "Wag the Dog" that says, "A good plan today is better than a perfect plan tomorrow." That's exactly it. You're never going to have perfect information and things are always going to change, so you've got to get out there and do it now.

It's amazing when you take that attitude and constantly reinforce it, how many good decisions people can make quickly.

But you just have to keep doing it, because you can get seduced into thinking that you've got more time, and you simply don't, given customer expectations going up and competitors who want to take away your children's college education money.

You've budgeted over $3 billion for research and development this year. What are the key areas you're spending on?

We are focused in the following areas:

- Communications and applications for semiconductors
- Wireless . . . for service providers and for business or enterprises
- Optical electronic systems primarily for service providers
- And communications software. We have a very large software business focused primarily on network management that serves service providers around the world.

By the way, the latency period between invention and product in the marketplace has been dramatically reduced.

How did you reduce that latency period?

A whole host of ways.

But it goes back to integrating the Bell Labs people with the business [units], tying their compensation directly to the business performance, having a closeness with the customers and really driving ourselves to meet unrealistic expectations — and knowing that that's never going to change.

I even moved some of the research folks into the development teams to give them a better sense of the issues that those engineers and developers face.

[As a result], I've found an amazing excitement in people that spurs them on to really want to get out there and be the leaders.

When you're dealing with enterprise business customers, as opposed to your carrier customers, what are the top network issues they're concerned about?

No. 1, they are trying to address systems that enable or facilitate integrated messaging for data and voice.

They have a need to improve customer service and figure out how their communications networks are going to help them do that.

And they need to find a cost-effective way to deal with the proliferation of data products, systems and networks that they're finding very costly to maintain and to deal with explosive growth [in network traffic].

What, if anything, do you think business customers would most like to see change at Lucent?

They would probably like to see us bring the reliability of our voice networks to the data world to reduce their cost of ownership and to work with carriers to offload some of the burden of management of WANs and campus-wide [nets].

Aren't you working on all that already?

Absolutely, but all those things are not there today, so that's what the customers would like to see.

How important is the Internet in terms of driving your strategy vs. the goal of simply solving communications problems? Can you distinguish between the two anymore?

I think we're going to see an overhaul of [the Internet] in the next couple of years, probably some fundamental changes to IP [and added] intelligence to make [the 'Net] more facile and easier to grow.

At that point in time, I think the Internet will be indistinguishable from [corporate] communications networks. It will be an integral part as opposed to something that is adjunctive. ■

The Bay that House built

CEO David House brings Bay Networks back by dint of will.

By Bob Brown

You've received a ton of good press since taking over as Bay's CEO and leading the company's financial turnaround. Have you been mostly good or lucky?

Both. I've been lucky in that I inherited a company that has excellent technology and a broad product line loved by network managers and engineers. And I'm lucky that the people at Bay were ready for change. Where have I been good? I'm proud of the management structure that I put in place, the people that I've hired, the team I've built. [I'm happy] with the process and methodology of goal setting, training and making people accountable [that I've put in place].

JASON GROW

What are the keys to Bay surviving and thriving in such a competitive internetwork market?

We are a product and technology leader and need to continue to be that. For example, we've got to drive the routing switch, which is a new product category. The standardization on IP has created an opportunity in the advances of silicon technology to the point where we can actually route in silicon. And this gives us about a two order of magnitude improvement in price performance over software-based routers.

Routing switches are going to displace routers from a lot of the positions they're in now, or at least the growth and sales of routers. Service is [also] critical. We have world-class service, but I want to have our service be a positive differentiator for us.

Bay started off the year by acquiring remote access vendor New Oak Communications, Inc. and net management start-up Netsation Corp. What's your thinking at this time about acquiring companies and technologies vs. building technology internally?

Our policy is to develop products where we have the expertise and to acquire [or partner with] companies with products and capabilities in areas where we don't. We went to systems engineers and customers to identify the areas where we didn't have the technology that we would need in the next couple of years. We identified seven areas and formed seven teams around that. We also put together a mergers and acquisitions team, really an overriding eighth team, and developed a process for acquiring companies. [These teams focus on] identifying, screening, comparing, negotiating with, purchasing and integrating other companies of interest. In some of the seven areas identified we decided to do acquisitions, and two of those we announced near the beginning of this year. And in another area, we made an equity investment and signed a technology agreement with Netspeak [Corp.]. [Bay also addressed a couple areas through internal development and OEM deals.] Now we're at the point of starting all over again. I suspect we'll identify a new set of areas where we want to expand our horizons or add new capabilities.

How would you describe Bay's culture? Loosey-goosey, button-down?

It's a focused, organized, disciplined place. It was a loosey-goosey place a year and a half ago, I think. But it's extremely focused as a result of the management process that I put together.

I have here, in my notebook in front of me, a section for my calendar and for phone numbers, and then a section for goals. It starts out with the Bay values, and then it's got three-year strategic goals, and they're organized around innovation, customers, people and shareholder value. Then I've got one-year goals for the corporation, again centered around innovation, customers, people and shareholder value. And behind that I have milestones for the top 15 development programs, marketing programs, etc. So I set the role model: make commitments and be accountable. Then my staff has annual goals that support mine but go into more detail, and they have quarterly goals.

In dealing with your customers, what's the top network issue that they're concerned about?

The top network issue is surviving the onslaught of the Web. Everybody was busily putting their mission-critical applications on their networks . . . but then the Web came along, and that wasn't planned. The load that Web traffic has put on the backbone is causing a meltdown at a time when the network has become critical to the corporation.

What, if anything, would customers most like to see change at your company?

They'd like us to do a better job of keeping them informed. We've done that, but we're not done. Where we've had a big lead in technology, Cisco [Systems, Inc.] had a big lead in marketing and communications. We're narrowing that marketing lead, while adding to our technology lead.

What are you doing to improve your marketing?

The first thing was just to get the sales force organized and directed, [to get] people knowing what it was they're supposed to do and sell. We had a big effort to develop training for various divisions. We've come up with a modular training program where we have training by products and can customize training to each individual. We also have multiple delivery systems — CD-ROM, live classrooms, self-guided study material, etc. ■

Who's zooming who

Acquisitions are reshaping the network industry landscape.

By Bob Brown

Are you finding it increasingly hard to keep tabs on the players in this exploding market? Don't fret — it isn't your age creeping up on you. Mergers and acquisitions are reshaping the network industry landscape on a weekly basis.

Cascade Communications Corp. ventures forth with a bold acquisition, then turns around and gets acquired itself. Familiar icons McAfee Associates, Inc. and Network General Corp. merge and then re-emerge under the remarkably unremarkable moniker Network Associates, Inc. Gone are industry stalwarts CrossComm Corp. and U.S. Robotics, now each part of a bigger company.

Last year, domestic merger and acquisition transactions nearly hit the $1 trillion mark across all industries, but action in the network business was the most feverish of all. Telecommunications deals alone accounted for about 10% of those dollars, according to Securities Data Co., a Newark, N.J., company that tracks mergers and acquisitions.

Of course, the acquisition binge has affected most every segment of the industry, from security software vendors to Internet service providers to switch suppliers. Seven of the top 10 acquisitions in North America last year involved network product or service vendors, according to Broadview Associates LLC, a Fort Lee, N.J., investment bank that specializes in mergers and acquisitions.

These deals included WorldCom, Inc.'s surprise $37 billion bid for MCI Communications Corp., 3Com Corp.'s $7.3 billion purchase of U.S. Robotics, Ascend Communications, Inc.'s $3.6 billion buyout of Cascade and Compaq Computer Corp.'s $4 billion takeover of Tandem Computers, Inc. Compaq followed up the Tandem deal with the January acquisition of Digital Equipment Corp. for $9.6 billion.

"It's not just the number and value of the deals that's striking — it's the boldness of the deals," says Greg Rossman, a principal at Broadview.

Industry watchers attribute the feeding frenzy to several factors. Despite some rocky moments for technology stocks during 1997, most of the leading companies' stock valuations were high, giving the firms plenty of money with which to play. Combine that with low interest rates, customer demand for one-stop shopping and a blossoming of start-ups in hot new sectors such as the Internet, and it's no wonder network vendors are in the mood to shop.

FACTOID

The value of all acquisitions announced in the network industry during 1997 totaled more than $100 billion.

Take Microsoft Corp., for instance. The company has some $9 billion in cash on hand and a market capitalization of about $199 billion. Microsoft splurged last year to buy companies in the messaging, security and multimedia product markets (see chart, page 86).

Fierce competition is a big driver, as well. In telecom, for example, carriers looking to exploit a more open regulatory environment are scrambling to piece together end-to-end service stories. And internetwork equipment companies are locked in time-to-market races that have them out hunting start-ups developing Gigabit Ethernet, remote access and other gear. Cisco, which is oozing with money, bought six companies for a total of about $570 million last year and made a handful of minority investments to boot.

The result of all this activity is that the industry is coming to be dominated by fewer — but larger — companies. Start-ups have come to recognize how difficult it is to go it alone, resulting in far fewer initial public offerings last year. Only 134 venture-backed firms went public in 1997, roughly half the number that went public the year before, according to Securities Data.

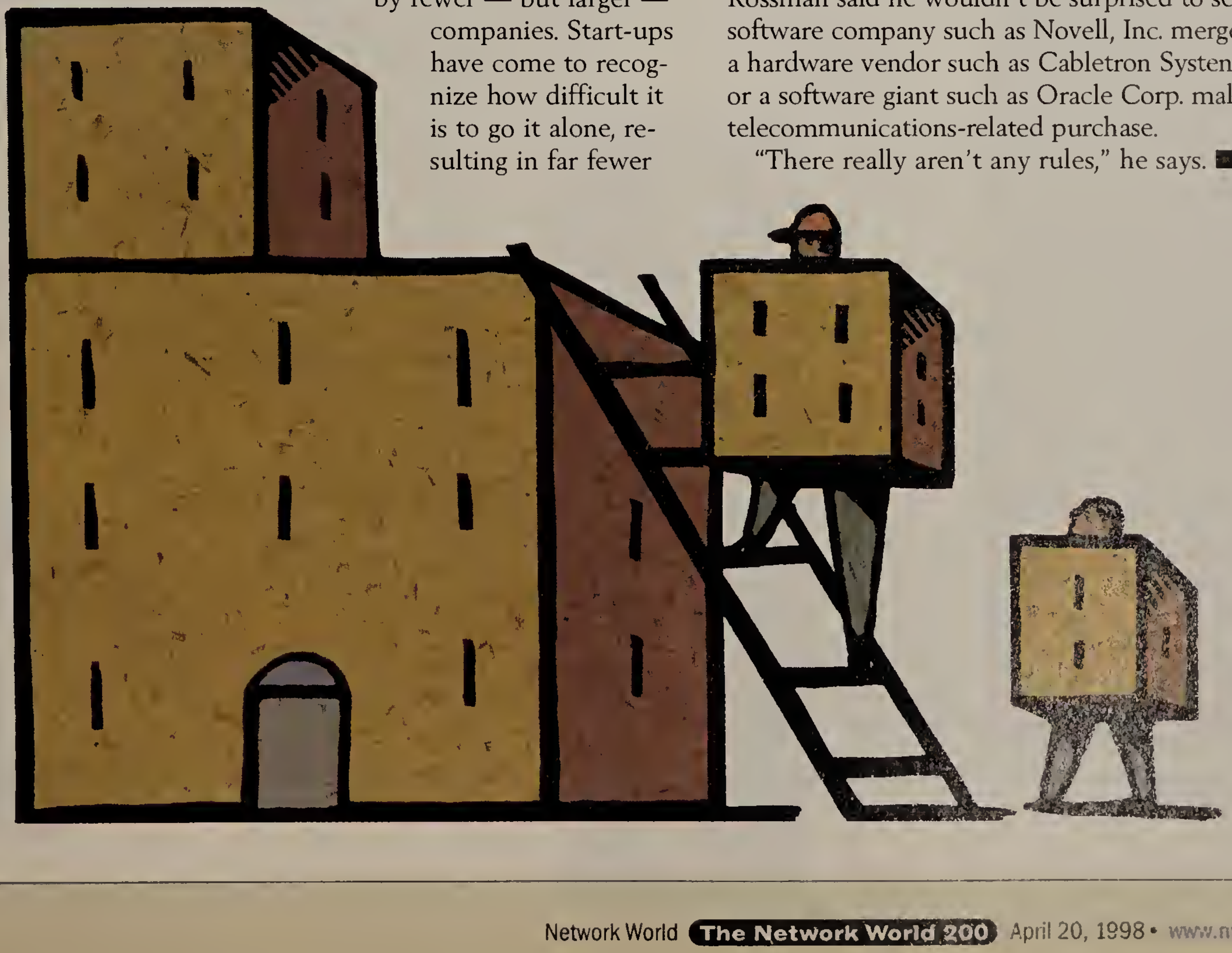
Many small companies agree to be acquired not because they can't compete on the technology front, but because they can't touch the bigger companies when it comes to product distribution, says Barry Eggers, a general partner with San Francisco-based Weiss, Peck & Greer Venture Partners, L.P.

"In the mature datacom market, distribution is controlled by the big players," he says. "A private company may have great technology but may not be able to reach enough of the market."

For customers, the acquisition activity is a mixed blessing. The bigger companies tend to have stronger service and support staffs and a better variety of products and services. The downside is that there are fewer small companies around that can provide customized technology and support.

What lies ahead on the acquisition highway? More of the same, and probably some unexpected combinations as well, Rossman says. For instance, Rossman said he wouldn't be surprised to see a software company such as Novell, Inc. merge with a hardware vendor such as Cabletron Systems, Inc. or a software giant such as Oracle Corp. make a telecommunications-related purchase.

"There really aren't any rules," he says. ■



NETWORK INDUSTRY ACQUISITION ACTION

Acquiring Company	Company acquired	Acquired company's area of expertise	Acquisition announced	Value of transaction
3Com	U.S. Robotics	Remote access, high-speed modems	February 1997	$7.3 billion
ACT Networks	SourceCom	Digital subscriber line technology	July 1997	$8.6 million
Ascend	Whitetree	ATM and Ethernet switching	February 1997	$53.4 million
	Cascade Communications	Carrier-class frame relay, ATM and IP switching	March 1997	$3.7 billion
AT&T	Teleport Communications Group	Competitive local exchange carrier services	January 1998	$11.3 billion
Axent Technologies	Raptor Systems	Firewalls	December 1997	$244 million
Bay Networks	Isotro Network Management	DNS and DHCP technology	April 1997	$11 million
	Rapid City Communications	Routing switches	June 1997	$155 million
	New Oak	Remote access	January 1998	$156 million
Cabletron	Digital Equipment's Network Product Business	Switches, hubs	November 1997	$430 million
	YAGO Systems	Switching routers	January 1998	$213 million
Cascade Communications	Sahara Networks	ATM backbone gear	January 1997	$213 million
Century Telephone Enterprises	Pacific Telecom	Local exchange service	June 1997	$2.2 billion
Cisco Systems	Telesend	Digital subscriber line technology	March 1997	Undisclosed
	Skystone Systems	SONET/SDH technology	June 1997	$89 million
	Global Internet Software Group	Windows NT network security	June 1997	$40 million
	Ardent Communications	Multiservice access products	June 1997	$156 million
	Dagaz Technologies	Digital subscriber line technology	July 1997	$108 million
	LightSpeed International	Voice signaling translation software	December 1997	$160 million
Compaq	Microcom	Remote access	April 1997	$280 million
	Tandem Computers	Fault-tolerant computers, clustering technology	June 1997	$4 billion
	Digital Equipment	Workstations, servers, service and support	January 1998	$9.6 billion
Computer Associates	Avalan Technologies	Remote control software	November 1997	Undisclosed
Gateway 2000	Advanced Logic Research	Servers	June 1997	$194 million
GTE	BBN	Internet access, Web site hosting	May 1997	$616 million
Harbinger	Premenos	Internet-based EDI	October 1997	$210 million
Hewlett-Packard	Symantec's management tools	Desktop and server management	February 1997	$30 million
	VeriFone	Electronic commerce	April 1997	$1.3 billion
Intel	Case Technology	Fast Ethernet technology	January 1997	$72 million
Intermedia	Digex	Internet access	June 1997	$153 million
Larscom	NetEdge	ATM access	December 1997	$32 million
Lucent	Octel	Voice, fax and electronic messaging	July 1997	$1.8 billion
	Livingston Enterprises	Remote access	October 1997	$650 million
	Prominet	Gigabit Ethernet switching	December 1997	$200 million
McAfee (now Network Associates)	Network General	Network monitoring	October 1997	$1.4 billion
Micron Electronics	NetFRAME Systems	Servers	June 1997	$14 million
Microsoft	Interse	Web site analysis software	March 1997	Undisclosed
	WebTV	Internet television	April 1997	$425 million
	Dimension X	Java and interactive media	May 1997	Undisclosed
	LinkAge Software	Directory management, e-mail	June 1997	Undisclosed
	Hotmail	Free e-mail	December 1997	Undisclosed
Netscape	Actra (Bought GEIS' part of the venture)	Electronic commerce	November 1997	$56 million
	Kiva Software	Web servers	November 1997	$173 million
Network Peripherals	NetVision	LAN switches	April 1997	$6 million
Newbridge/Siemens	RADNet	ATM access	December 1997	$75 million
Nokia	Ipsilon Networks	IP switching	December 1997	$120 million
Olicom	CrossComm	ATM and multiprotocol router technology	June 1997	In excess of $90 million
SBC Communications	Southern New England Telecommunications	Local and long-distance telecommunications services	January 1998	$4.4 billion
Sprint	Paranet	Network and systems management services	July 1997	In excess of $375 million
Sun Microsystems	Diba	Internet appliances	July 1997	Undisclosed
	Integrity Arts	Smart card technology	August 1997	Undisclosed
Teleport Communications Group	CERFnet Services	Internet access and Web hosting services	January 1997	$61 million
	ACC	Competitive local exchange carrier service	November 1997	$1 billion
Tivoli	Unison	Workload management software	September 1997	$170 million
	Software Artistry	Help desk technology	December 1997	$200 million
Trusted Information Systems	Haystack Laboratories	Intrusion detection and monitoring	October 1997	Undisclosed
VTEL	Compression Labs	Videoconferencing products	January 1997	$80 million
WorldCom	CompuServe Network Services/ANS Communications	Data communications services	September 1997	$1.2 billion
	Brooks Fiber	Telecommunications services	October 1997	$2.9 billion
	MCI	Telecommunications services	October 1997	$37 billion

SOURCE: NETWORK WORLD; HAMBRECHT & QUIST, SAN FRANCISCO; HOULIHAN LOKEY'S MERGERSTAT, LOS ANGELES **For a more complete listing of network industry acquisitions, go to** www.nwfusion.com. **DocFinder: 6711.**

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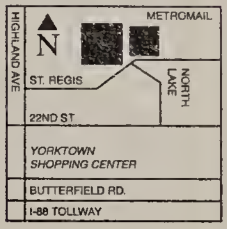

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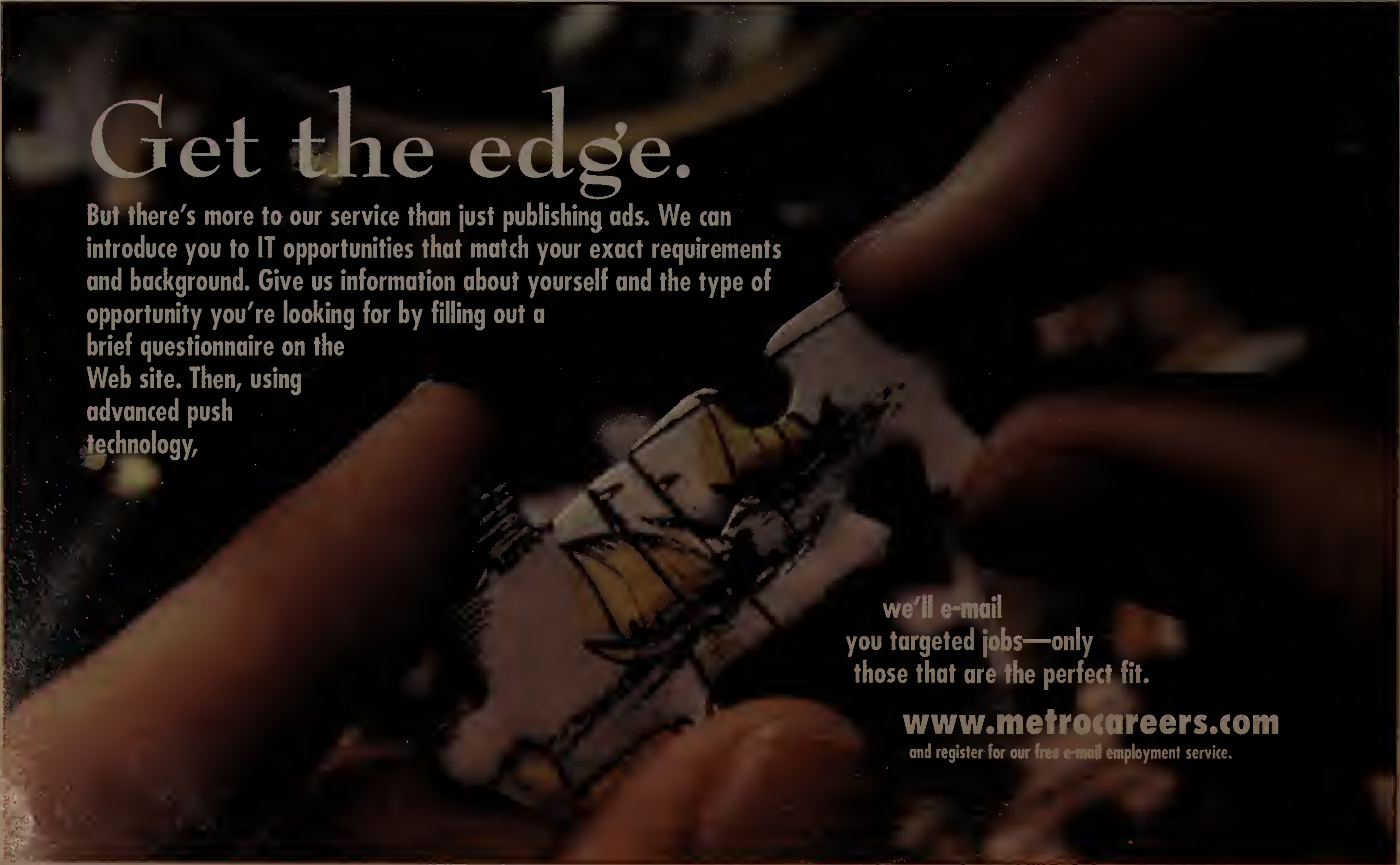

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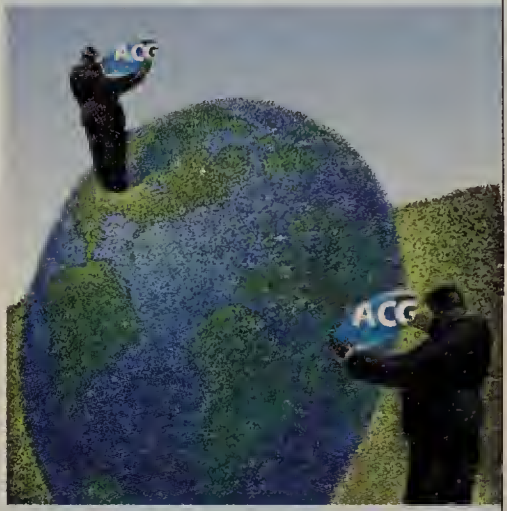

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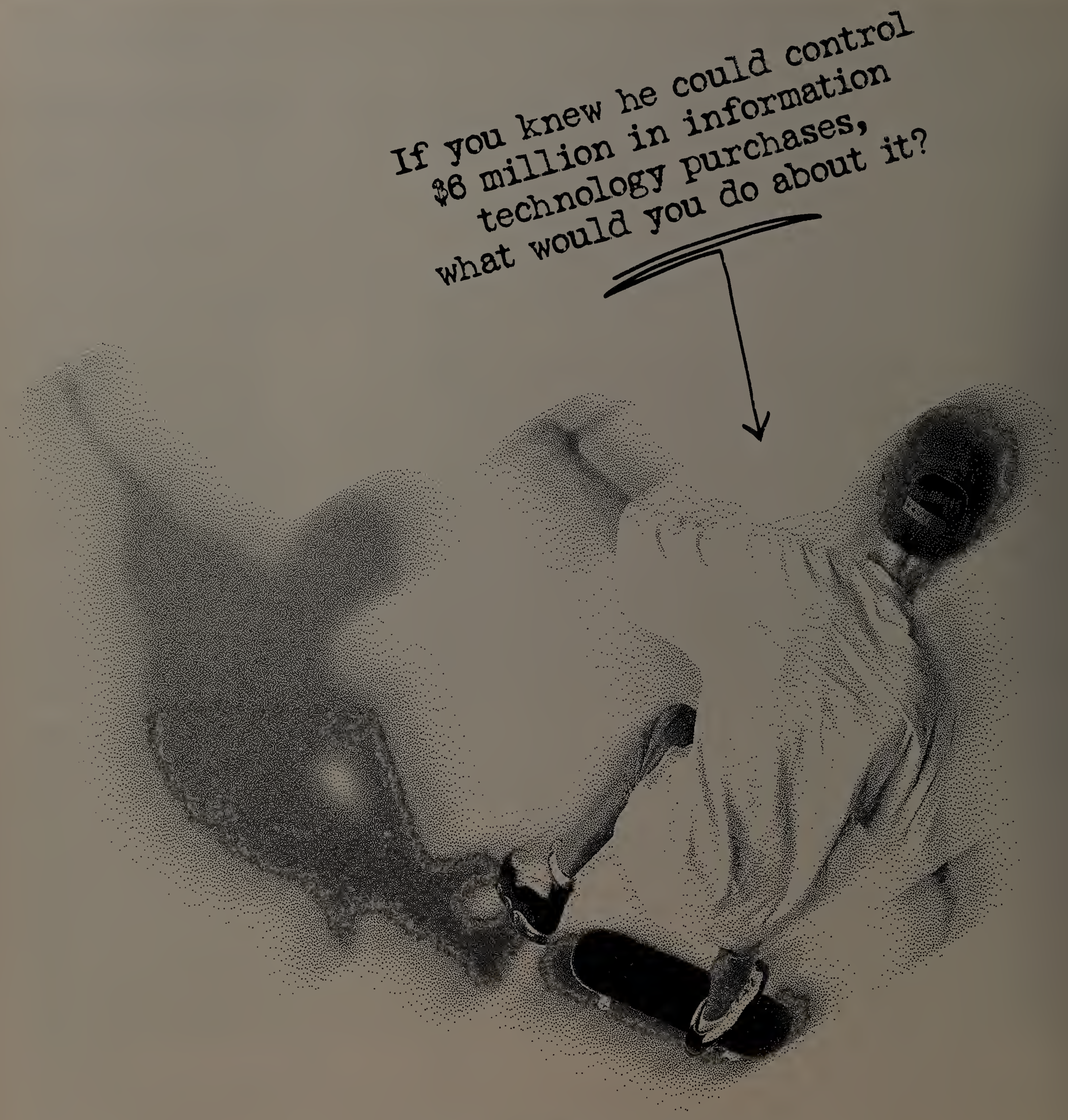
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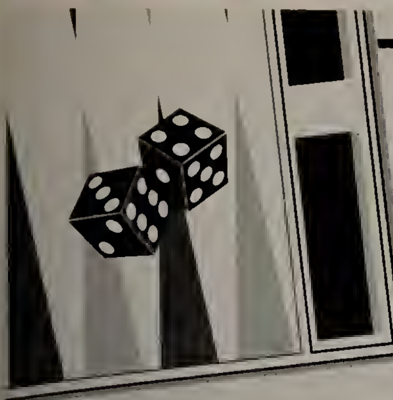

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May 11th Issue

Network Management Survey

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✓ Users ability to automate management functions

✓ Users ability to manage their networks as a single integrated entity

✓ The movement toward big network and system management frameworks

✓ Impressions of web-based management tools-are they living up to their promises?

☐ Space reservation Friday, April 24th

☐ Materials due Wednesday, April 29th

☐ Add this survey issue to you media schedule

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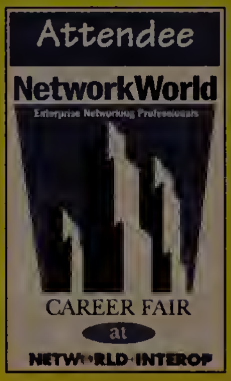

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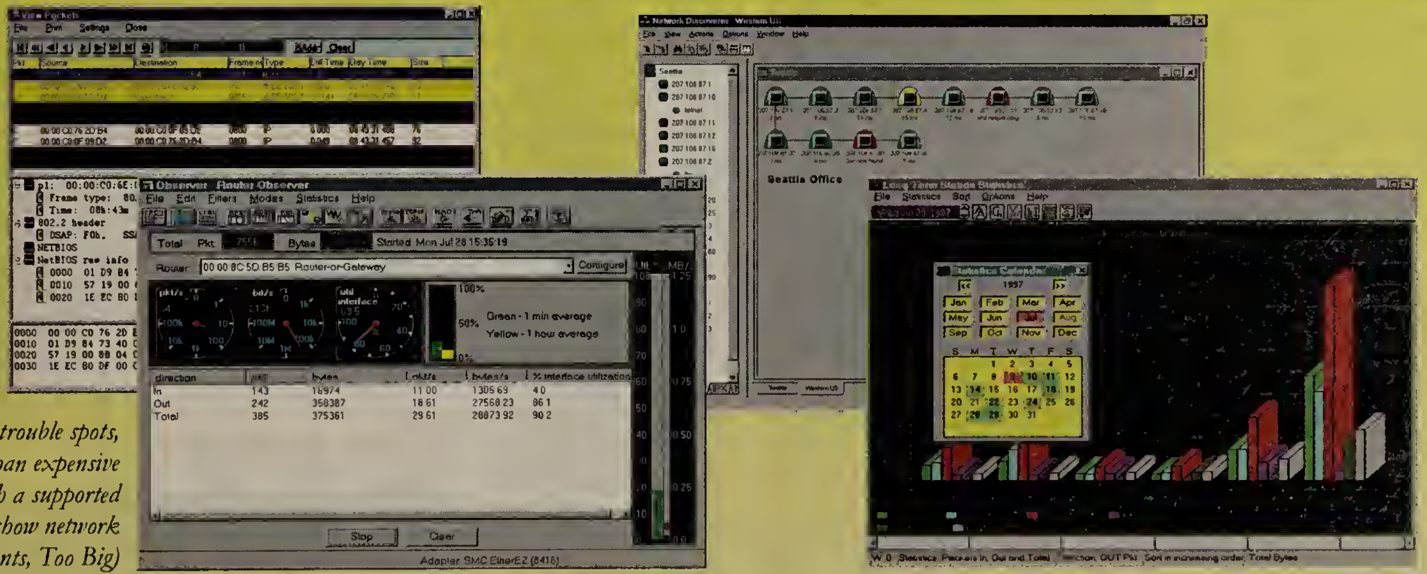

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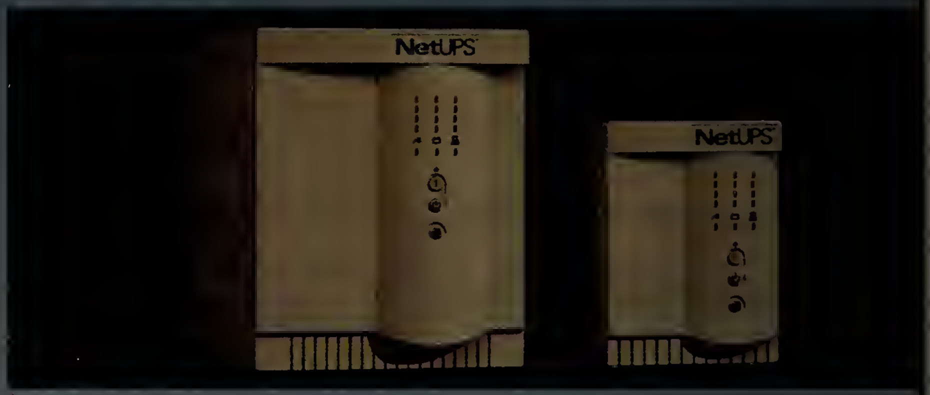

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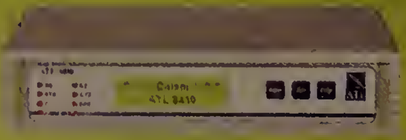

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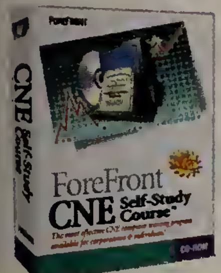

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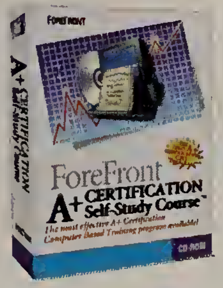
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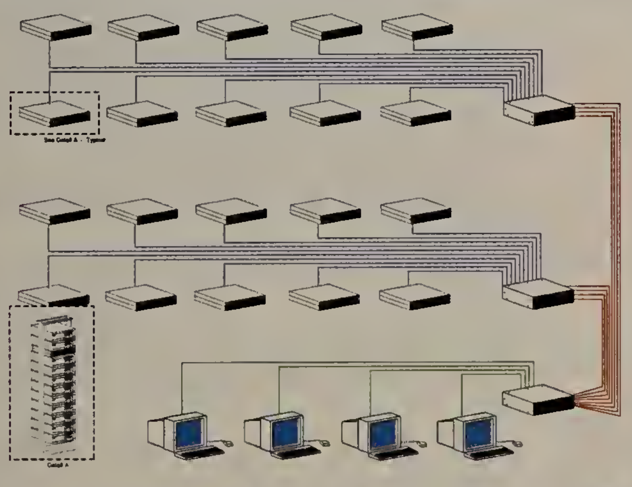

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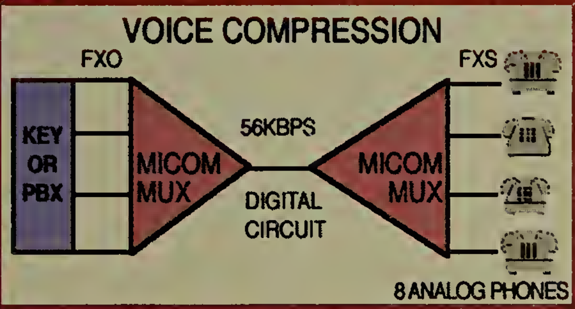

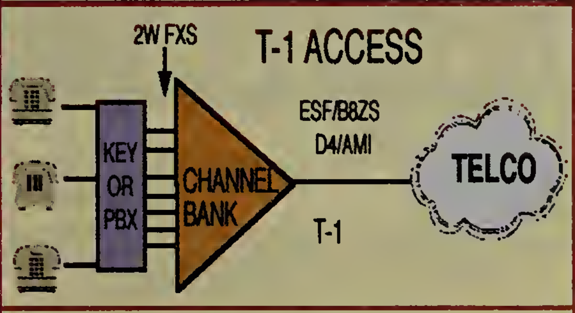

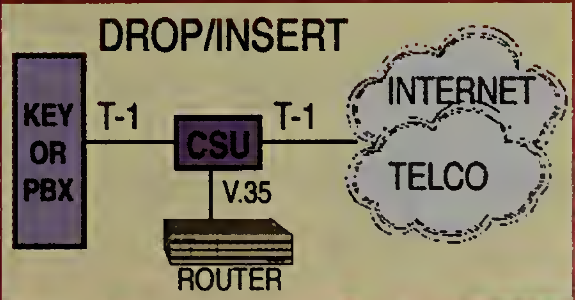

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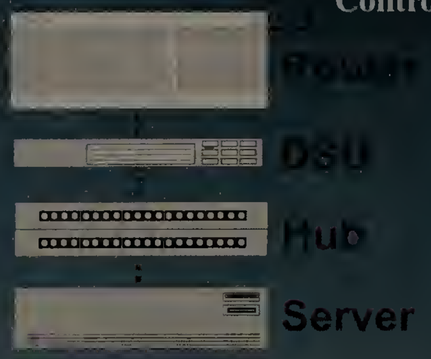

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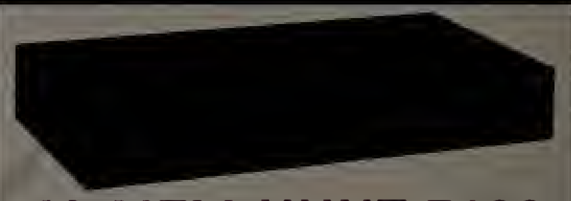

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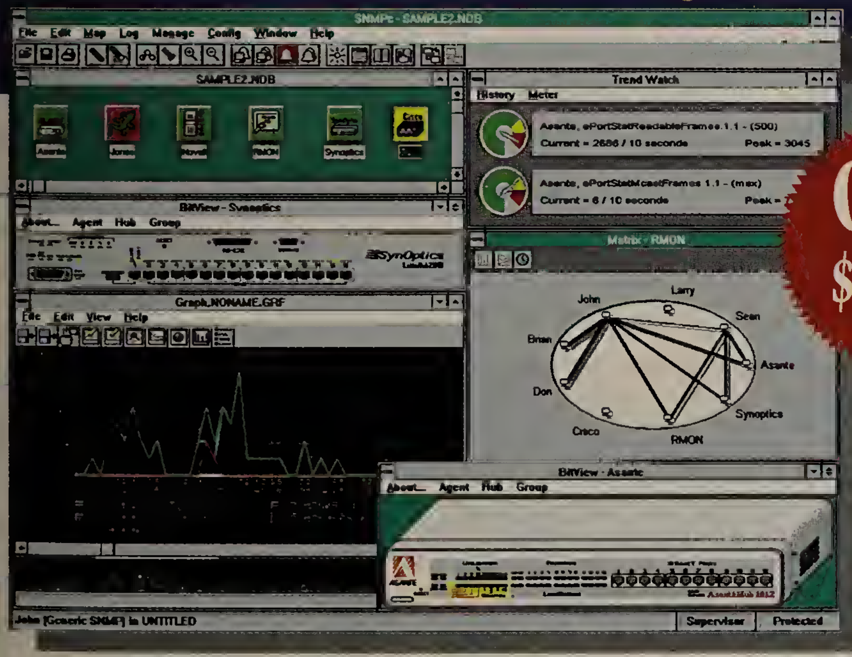

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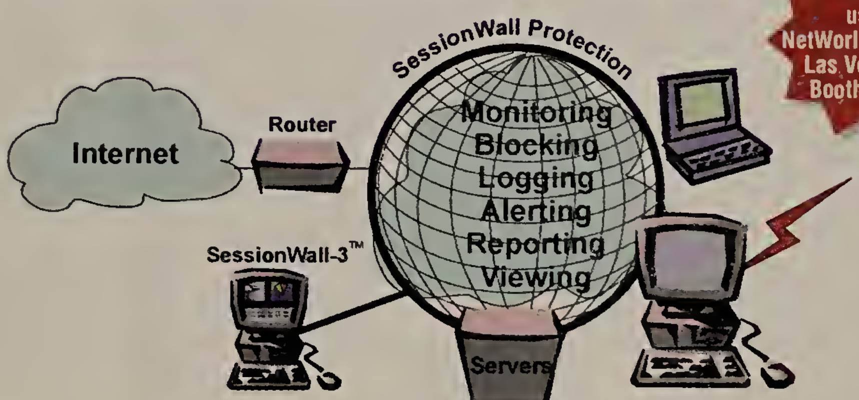

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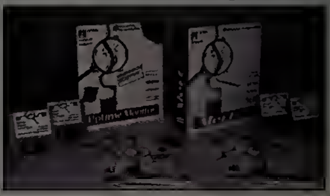

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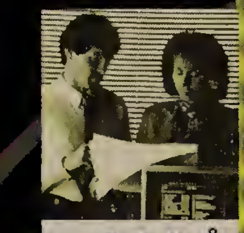

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digital

Backspin

The responsibility is on our shoulders

In this Network World 200 issue you'll find the great players sliced, diced, salted, boiled and picked over to try to determine just what the hell is going on in the economy of our industry.

Mark Gibbs

The story that emerges is that our industry is still growing at an astounding rate. But while the NW200 figures are impressive, there's a story about industry growth that isn't found in the tabulations. The story is how that growth is changing our culture.

At the heart of the change is the acceleration of human experience that computer technologies enable. These technologies extend human senses and sensibilities in ways we never dreamed possible. And as a culture, we are embracing the change without fully understanding what it is doing, and ultimately will do, to us.

I doubt whether any readers would argue that these changes are real.

You know our children are growing up with an implicit understanding of Boolean searches and a facility with computers that is astounding. And you know news is traveling faster than ever, giving us the symptoms of information overload.

<digression> Did you know that news of Lincoln's assassination took three weeks to reach London? If it happened today, you would switch on CNN and see film of the bullet entering his head. <digression>

What is interesting (or frightening, depending on your viewpoint) is that these changes, and their consequences, are unstoppable. This is because our industry has created the most addictive drug in the history of the world: Digitalization — not just the computerization of our processes but the transformation of our thinking into computer metaphors and models.

Digitalization has significant side effects. For example, it has a curious tendency to induce tunnel vision — to restrict our view of what matters down to the immediate concerns of getting the job done. It encourages tactical thinking rather than strategic vision.

For example, the Year 2000 problem shows that tactical thinking about the use of computers has been with us for a long time. The roots of this thinking go back to the 1950s. The editor in charge of business books for Prentice Hall in 1957 was quoted as saying, "I have traveled the length and breadth of this country and talked with the best people, and I can assure you that data processing is a fad that won't last out the year."

However, digitalization in and of itself is neither good nor bad. It just is. And the power of the free market and the momentum of digitalization ensures that our industry isn't going in any direction but up in value and becoming more ubiquitous in scope.

For the NW200, the implications are profound. Society has started to take more notice of computers and their creators as their influence and impact has deepened and become more pervasive. In the process, the industry has become increasingly politicized. Microsoft and the Department of Justice are just the tip of that particular iceberg.

These political battles are generally triggered by a primitive, autonomic reaction to change. They are based on the desire to maintain the status quo and the need to do something — control Internet gambling, create laws concerning spamming, whatever.

The industry could be in danger of being regulated and held for ransom by the sluggish, self-absorbed political machine that owes its thinking to the Industrial Era while it spouts the rhetoric of the Computer Era.

Our great industry needs to give a mature presentation to the world of the what, how and why of what we do. We have to understand that we are the creators of tomorrow's society and act accordingly. I shall leave the last words to Winston Churchill: "The price of greatness is responsibility."

Comments to nwcolumn@gibbs.com or (800) 622-1108, Ext. 7504.

'NET BUZZ

The latest on the Internet/intranet industry

By Chris Nerney

WHAT'S IN A NAME? EVERYTHING Would you name an exciting new product "Application"? Of course not. It tells the audience nothing. How about "Software"? Again, too generic, too bland.

Well, for some reason the folks at **Sun's JavaSoft** division have decided to burden one of their best weapons in the Java war against **Microsoft** with a name that not only implies pedestrian unimportance but also bears negative connotations.

We're talking about a piece of software announced by JavaSoft in December called Java Activator.

Activator is a downloadable applet that checks a user's machine to see if the browser has the latest Java Virtual Machine (JVM) needed to run applications written in Sun's Java programming language. If the machine doesn't have the JVM, Activator lets users download it.

The product was hailed by many as a brilliant ploy to neutralize Microsoft's attempts to control the spread of Java. Pretty exciting, huh? Thousands of Java developers certainly thought so.

However, JavaSoft ran into trademark problems with the Activator name and was forced to seek a substitute.

Apparently all the good names were taken because the new name for Activator, scheduled to be unveiled by JavaSoft today, is (drummer, take five) . . . Java Plug-In.

C'mon, you Javaheads, this is the product that will help users get around Microsoft's Maginot Line, and the best you could come up with is Java Plug-In?

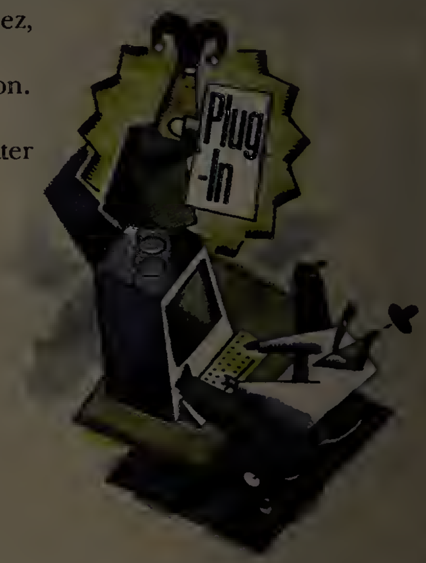
First off, no one even likes plug-ins. They rank with attachments and spam as things people hate to deal with online.

Granted, your applet is a plug-in, but geez, that's not exactly the selling point.

Second, the new name lacks inspiration. Where's the spirit, the feistiness, the showmanship? We can come up with 10 better names right off the top of our heads:

Gates-buster
Lo(Java)Jack
Java Liberator
The Other Pie in Bill's Face
Viva le Java!
Arnold
Java's Underground Railroad
Another Interim Solution
Jumpin' Java Flash
It's Java-licious!

See how easy it is? And even if they're not all winners, at least they have a pulse. Now get back into that brainstorming session and come out with something that does your product proud.



HEY, THE LINE BEGINS WAY BACK THERE A well-placed 'Net Buzz source hints that "Microsoft is going to be facing a third-party antitrust suit in the not-too-distant future."

While our source wouldn't say who plans to bring the suit, he did say "the interest of every Java developer will be fought for in this case."

That led us to **Rick Ross,** founder of the 15,000-member **Java Lobby,** but Ross says the suit isn't being brought by the 8-month-old group.

Sun filed a lawsuit against Microsoft last October, alleging that Microsoft violated its Java licensing agreement by shipping products that weren't Java-compatible. Last month a judge in San Jose, Calif., ordered Microsoft to remove the Java logo from the company's Internet Explorer 4.0 browser, at least until the legal battle is settled.

The U.S. **Department of Justice** is building an antitrust case against Microsoft as well, and 11 state attorneys general also are preparing to take legal action against the company.

'Net Buzz won't stop until we corner the market on Internet- and intranet-related news, gossip and innuendo. The feds be damned! Be part of the monopoly by sending us — and only us — your best tips. Contact Chris Nerney at (508) 820-7451 or cnerney@nww.com.

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